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TRANSACTIONS

OF THE

AMERICAN

SURGICAL ASSOCIATION.

VOLUME THE TWENTY-SIXTH.

EDITED BY

RICHARD H. HARTE, M.D.,
RECORDER OF THE ASSOCIATION.

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OFFICERS OF THE ASSOCIATION,

ELECTED MAY, 1908.

PRESIDENT.

C. B. G. DE NANCRÈDE, M.D.

VICE-PRESIDENTS.

A. G. GERSTER, M.D.
LEONARD FREEMAN, M.D.

SECRETARY.

ROBERT G. LE CONTE, M.D.,
1530 Locust St., Philadelphia.

TREASURER.

CHARLES A. POWERS, M.D.,
Fourteenth and Stout Sts., Denver, Col.

RECORDER.

RICHARD H. HARTE, M.D.,
1503 Spruce St., Philadelphia.

COUNCIL.

ALBERT VANDER VEER, M.D.,
DUDLEY P. ALLEN, M.D.,
WILLIAM H. CARMALT, M.D.,
C. B. G. DE NANCRÈDE, M.D.,
ROBERT G. LE CONTE, M.D.,
CHARLES A. POWERS, M.D.,
RICHARD H. HARTE, M.D.,
} *Ex-officio.*

PUBLICATION COMMITTEE.

RECORDER, SECRETARY, AND TREASURER, *ex-officio.*

COMMITTEE ON ANNUAL MEETING.

FRANCIS J. SHEPHERD, M.D., E. WYLLYS ANDREWS, M.D.,
PRESIDENT, SECRETARY, RECORDER, AND THE CHAIRMAN OF THE ADJUNCT LOCAL COMMITTEE OF ARRANGEMENTS, *ex-officio.*

COMMITTEE ON NECROLOGY, CREATED IN 1884.
(Report by Title.)

F. H. GERRISH, M.D.,
N. B. CARSON, M.D.,
WM. L. RODMAN, M.D.

CONGRESS OF AMERICAN PHYSICIANS AND SURGEONS, WASHINGTON, D.C., 1910.

Delegate: HERBERT L. BURRELL, M.D.
Alternate: ARTHUR DEAN BEVAN, M.D.

CONGRESS OF GYNECOLOGISTS, BRUSSELS, SEPTEMBER 24, 1908.

Delegates:

JOHN B. MURPHY, M.D. LEWIS L. McARTHUR, M.D.

DELEGATE TO THE INTERNATIONAL MEDICAL CONGRESS, BUDAPEST, AUGUST, 1909.

(To be appointed.)

Place of next meeting:

PHILADELPHIA, PA., 1909.

ADJUNCT LOCAL COMMITTEE OF ARRANGEMENTS.

EDWARD MARTIN, M.D., *Chairman,*
JOHN B. DEAVER, M.D.,
JOHN H. GIBBON, M.D.

LIST OF THE PRESIDENTS

OF THE

ASSOCIATION FROM THE TIME OF ITS INSTITUTION.

ELECTED

1880. †SAMUEL DAVID GROSS, M.D., LL.D., D.C.L. Oxon., LL.D. Cantab., LL.D. Edin.—Founder of the Association.
1883. †EDWARD MOTT MOORE, M.D., LL.D.
1884. †WILLIAM THOMPSON BRIGGS, M.D.
1885. †MOSES GUNN, A.M., M.D., LL.D.
1886. †HUNTER McGUIRE, M.D., LL.D.
1887. †D. HAYES AGNEW, M.D., LL.D.
1888. DAVID WILLIAMS CHEEVER, M.D., LL.D.
1889. †DAVID W. YANDELL, M.D.
1890. †CLAUDIUS HENRY MASTIN, M.D., LL.D.
1891. PHINEAS SANBORN CONNER, M.D., LL.D.
1892. NICHOLAS SENN, M.D., Ph.D., LL.D.
1893. JAMES EWING MEARS, A.M., M.D., LL.D.
1894. FREDERIC SHEPARD DENNIS, M.D.
1895. LOUIS McLANE TIFFANY, A.M. Cantab., M.D.
1896. JOHN COLLINS WARREN, M.D., LL.D. (Jefferson), Hon. F.R.C.S. Eng.
1897. †THEODORE F. PREWITT, M.D.
1898. WILLIAM W. KEEN, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1899. ROBERT F. WEIR, A.M., M.D., F.R.C.S. Eng.
1900. ROSWELL PARK, M.D.
1901. DE FOREST WILLARD, A.M., M.D., Ph.D.
1902. MAURICE H. RICHARDSON, A.B., M.D.
1903. NATHANIEL P. DANDRIDGE, M.D.
1904. GEORGE BEN JOHNSTON, M.D.
1905. ALBERT VANDER VEER, M.D.
1906. DUDLEY P. ALLEN, M.D.
1907. WILLIAM H. CARMALT, M.D.
1908. C. B. G. de NANCRÈDE, M.D.

† Deceased.

NOTICE.

THIS volume of TRANSACTIONS contains the papers read before the Association at the Meeting held May 4, 5, and 6, 1908.

The Association assumes no responsibility for the statements and opinions published in this volume.

FELLOWS

OF THE

AMERICAN SURGICAL ASSOCIATION.

MAY, 1908.

* Denotes Original Fellows.
† Denotes Senior Fellows.

ELECTED

1890. ABBE, ROBERT, M.D., 13 West Fiftieth Street, New York, Surgeon to St. Luke's Hospital. *Vice-President*, 1901.

1894. ALLEN, DUDLEY P., A.M., M.D., 1110 (old 260) Euclid Ave., Cleveland, Ohio. Professor of Surgery, Medical Department of Western Reserve University; Visiting Surgeon, Lakeside and Charity Hospitals; Consulting Surgeon to the Cleveland City Hospital. *President*, 1906; *Member of Council*, 1908.

†1890. ALLIS, OSCAR HUNTINGTON, A.M., M.D., 1604 Spruce Street, Philadelphia. Surgeon to the Presbyterian Hospital.

1902. ANDREWS, E. WYLLYS, A.M., M.D., 2525 Prairie Avenue, Chicago, Ill. Professor of Surgery, Northwestern University Medical School; Surgeon to Mercy Hospital and Michael Reese Hospital; Attending Surgeon to Cook County Hospital; Consulting Surgeon to the Provident Hospital.

1901. ARMSTRONG, GEORGE E., C.M., M.D., 320 Mountain Street, Montreal. Associate Professor of Clinical Surgery, McGill University; Surgeon to the Montreal General Hospital; Surgeon to the Western Hospital, Montreal.

1906. BARROW, DAVID, M.D., 148 Market Street, Lexington, Ky.

†1882. BARTON, JAMES M., A.M., M.D., 32 North New Hampshire Ave., Atlantic City, N. J.

ELECTED

1901. Bell, James, M.D., 409 Dorchester Street, Montreal. Professor of Clinical Surgery, McGill University; Surgeon to the Royal Victoria Hospital. *Vice-President*, 1904.

1900. Bevan, Arthur Dean, M.D., 100 State Street, Chicago. Associate Professor of Surgery, Rush Medical College, University of Chicago; Surgeon to Presbyterian Hospital.

1901. Binnie, J. F., M.B., C.M. (Aberdeen), Argyle Bldg., Twelfth and McGee Sts., Kansas City, Mo. Professor of Surgical Pathology and Clinical Surgery, Kansas City Medical College. *Vice-President*, 1907.

1906. Blake, John Bapst, A.M., M.D., 178 Beacon Street, Boston, Mass. Instructor in Surgery, Harvard Medical School; Assistant Surgeon to the Boston City Hospital; Surgeon to the Long Island Hospital and St. Elizabeth's Hospital, Boston, Mass.

1902. Blake, Joseph A., M.D., 601 Madison Avenue, New York. Instructor in Surgery, Columbia University; Attending Surgeon to St. Luke's Hospital; Junior Surgeon to the Roosevelt Hospital; Consulting Surgeon to the Northern Dispensary.

1901. Bloodgood, Joseph C., B.S., M.D., 904 North Charles Street, Baltimore, Md. Associate in Surgery in the Johns Hopkins University.

1901. Bosher, Lewis C., M.D., 717 East Franklin Street, Richmond, Va. Professor of Surgery, Medical College of Virginia; Surgeon to the Old Dominion Hospital.

†1890. Bradford, Edward Hickling, A.B., M.D., 133 Newbury Street, Boston. Surgeon to the Children's and the Samaritan Hospitals; Assistant Professor of Orthopedic Surgery in the Harvard University.

1900. Brewer, George Emerson, M.D., 61 West Forty-eighth Street, New York City. Professor of Clinical Surgery in College of Physicians and Surgeons, Columbia University; Junior Surgeon, Roosevelt Hospital; Attending Surgeon, City Hospital; Consulting Surgeon to the Ophthalmic and Aural Institute, and to the Perth Amboy Hospital.

1906. Bristow, A. T., A.B., M.D., 234 Clinton Street, Brooklyn, New York. Clinical Professor of Surgery at the Long Island College Hospital; Attending Surgeon to the Kings County Hospital, St. John's Hospital, and Long Island College Hospital; Consulting Surgeon to the Long Island State Hospital, the Bushwick Central Hospital, and the Swedish Hospital.

ELECTED

1895. Bryant, Joseph D., M.D., 32 West Forty-eighth Street, New York. Professor of Anatomy and of Operative and Clinical Surgery, Bellevue and St. Vincent's Hospitals; Consulting Surgeon to Gouverneur Hospital, Hospital for Ruptured and Crippled, St. Joseph's and Hackensack Hospitals, Asylum for Insane, New York, etc.

1882. Bull, William Tillinghast, A.B., M.D., 35 West Thirty-fifth Street, New York. Adjunct Professor of the Practice of Surgery and of Clinical Surgery in the College of Physicians and Surgeons, New York; Surgeon to the New York and St. Luke's Hospitals; Consulting Surgeon to the Hospital for Ruptured and Crippled, and to the New York Cancer Hospital.

1900. Bunts, Frank E., M.D., 275 Prospect Street, Cleveland, Ohio. Professor of Principles of Surgery and Clinical Surgery in Medical College of Western Reserve University; Visiting Surgeon to St. Vincent's Charity Hospital; Consulting Surgeon to Cleveland City and Lutheran Hospitals.

1893. Burrell, Herbert Leslie, M.D. (Harvard), 22 Newbury Street, Boston, Mass. Assistant Professor of Surgery in Harvard University; Visiting Surgeon, Boston City Hospital; Visiting Surgeon to the Children's Hospital; Consulting Surgeon, Carney Hospital and the Quincy Hospital. *Secretary*, 1895–1901.

1889. Cabot, Arthur Tracy, A.M., M.D., 1 Marlborough Street, Boston, Mass. Surgeon to Massachusetts General Hospital.

†1885. Carmalt, William H., A.M., M.D., 87 Elm Street, New Haven, Conn. Professor of Surgery in Yale University; Surgeon to the New Haven Hospital. *President*, 1907; *Vice-President*, 1895; *Member of Council*, 1908.

1896. Carson, Norman Bruce, M.D., 303 Humboldt Bldg., St. Louis, Mo. Professor of Clinical Surgery in the St. Louis Medical College; Surgeon to St. Louis and Mullanphy Hospitals and to the St. Vincent Insane Asylum, etc. *Vice-President*, 1903.

†1882. Cheever, David Williams, M.D., LL.D., 557 Boylston Street, Boston, Mass. Professor of Surgery (Emeritus) in Harvard University; Surgeon to Boston City Hospital. *President*, 1888.

1896. Cole, Charles Knox, A.M., M.D., Helena, Montana. Surgeon to St. John's, St. Peter's, and County Hospitals.

1898. Coley, William B., M.D., 5 Park Avenue, New York. Attending Surgeon to the General Memorial Hospital; Associate Surgeon to the Hospital for Ruptured and Crippled, New York.

ELECTED

*†1880. CONNER, PHINEAS SANBORN, M.D., LL.D., 215 West Ninth Street, Cincinnati, Ohio. Professor of Surgery in the Medical College of Ohio; Emeritus Professor of Surgery, Dartmouth Medical College; Surgeon to the Cincinnati and the Good Samaritan Hospitals. *President*, 1891; *Member of Council*, 1883, and 1895–1900; *Treasurer*, 1885–91.

1905. CRILE, GEORGE W., M.D., 275 Prospect Street, Cleveland, Ohio. Professor of Clinical Surgery, Western Reserve Medical College; Visiting Surgeon to St. Alexis' Hospital; Associate Surgeon to Lakeside Hospital.

1896. CURTIS, BENJAMIN FARQUHAR, A.B., M.D., 7 East Forty-first Street, New York. Professor of the Principles of Surgery and Clinical Surgery, University and Bellevue Hospital Medical College of New York; Attending Surgeon to St. Luke's and Bellevue Hospitals, and the General Memorial Hospital for Treatment of Cancer and Allied Diseases; Consulting Surgeon to New York Orthopedic Hospital and Dispensary.

1906. CUSHING, HARVEY, A.M., M.D., 107 East Chase Street, Baltimore, Md. Associate Professor of Surgery, Johns Hopkins University.

1896. CUSHING, HAYWARD WARREN, A.B., M.D., 90 Commonwealth Avenue, Boston, Mass. Junior Visiting Surgeon, Boston City Hospital; Assistant Surgeon, Children's Hospital, Boston.

1897. DA COSTA, JOHN CHALMERS, M.D., 2045 Walnut Street, Philadelphia, Pa. Clinical Professor of Surgery, Jefferson Medical College; Surgeon to the Philadelphia and the Phœnixville Hospitals.

1883. DANDRIDGE, NATHANIEL PENDLETON, M.D., 422 Broadway, Cincinnati, Ohio. Professor of Practice of Surgery and of Clinical Surgery in the Miami Medical College, Cincinnati. *President*, 1903; *Treasurer*, 1894–96; *Member of Council*, 1904.

1892. DEAVER, JOHN B., M.D., 1634 Walnut Street, Philadelphia. Surgeon-in-Chief to the German Hospital, Philadelphia.

1882. DENNIS, FREDERIC SHEPARD, M.D., F.R.C.S. ENG., 542 Madison Avenue, New York. Professor of Clinical Surgery, Cornell University, New York City; Visiting Surgeon to the Bellevue and St. Vincent's Hospitals; Consulting Surgeon to St. Joseph's Hospital, Yonkers, and Montefiore Home, New York City. *President*, 1894; *Vice-President*, 1887; *Member of Council*, 1889.

ELECTED

1901. ELIOT, ELLSWORTH, JR., M.D., 48 West Thirty-sixth Street, New York. Clinical Lecturer and Demonstrator of Surgery, College of Physicians and Surgeons, New York; Surgeon to the Presbyterian Hospital.

1893. ELLIOT, JOHN WHEELOCK, A.M., M.D. (Harvard), 124 Beacon Street, Boston. Surgeon to Massachusetts General Hospital.

1896. ESTES, WILLIAM LAWRENCE, A.M., M.D., South Bethlehem, Pa. Director and Surgeon-in-Chief of St. Luke's Hospital; Lecturer on Hygiene at Lehigh University.

1898. EVE, DUNCAN, A.M., M.D., 700 Church Street, Nashville, Tenn. Professor of Surgery and Clinical Surgery, Medical Department, Vanderbilt University; Surgeon to the Nashville City Hospital.

1901. FERGUSON, ALEX. HUGH, C.M., M.D., 10 Drexel Square, Chicago, Ill. Professor of Clinical Surgery in the Medical Department of the University of the State of Illinois; Professor of Surgery in the Post-Graduate Medical School of Chicago; Surgeon-in-Chief of the Chicago Hospital; Surgeon to Cook County Hospital for the Insane; Consulting Surgeon to Provident Hospital.

1899. FINNEY, JOHN M. T., M.D., 1300 Eutaw Place, Baltimore, Md. Associate Professor of Surgery, Johns Hopkins University.

1904. FRAZIER, CHARLES HARRISON, M.D., 1724 Spruce Street, Philadelphia, Pa. Professor of Clinical Surgery, University of Pennsylvania; Surgeon to the University Hospital.

1898. FREEMAN, LEONARD, B.S., M.D., *Vice-President*, 1908, 1801 Franklin Street, Denver, Col. Professor of Surgery, Gross Medical College; Surgeon to the Arapahoe County Hospital and to St. Anthony's Hospital.

†1882. GAY, GEORGE WASHINGTON, A.M., M.D., 665 Boylston Street, Boston, Mass. Senior Surgeon to the Boston City Hospital, Clinical Instructor in Surgery in Harvard University. *Member of Council*, 1882.

1892. GERRISH, FREDERIC HENRY, A.M., M.D. (Bowdoin), LL.D. (University of Michigan and Bowdoin), 675 Congress Street, Portland, Maine. Professor of Surgery in the Medical Department of Bowdoin College; Consulting Surgeon, Maine General Hospital.

1890. GERSTER, ARPAD G., M.D., CHIR.D., *Vice-President*, 1908, 34 East Seventy-fifth Street, New York. Professor of Surgery in the New York Polyclinic; Surgeon to the German and Mount Sinai Hospitals.

ELECTED

1906. GIBBON, JOHN H., M.D., 1608 Spruce Street, Philadelphia. Professor of Surgery, Jefferson Medical College; Surgeon to the Pennsylvania Hospital and the Bryn Mawr Hospital; Consulting Surgeon to the Woman's Hospital.

1906. GIBSON, C. L., M.D., 8 East Fifty-eighth Street, New York, N. Y. Professor of Clinical Surgery, Cornell University Medical College; Surgeon to St. Luke's and the City Hospitals.

1908. GUTHRIE, GEORGE W., M.D., 109 South Franklin Street, Wilkesbarre, Pa. Surgeon to the Wilkesbarre City Hospital; Consulting Surgeon to the Pittston Hospital and to the Palmerton Hospital.

†1892. HALSTED, WILLIAM STEWART, B.A., M.D., 1201 Eutaw Place, Baltimore, Md. Surgeon to Johns Hopkins Hospital.

1898. HARRINGTON, FRANCIS B., A.B. (Tufts College), M.D. (Harvard College), 201 Beacon Street, Boston, Mass. Surgeon to Massachusetts General Hospital.

1900. HARRIS, MALCOLM L., M.D., 100 State Street, Chicago, Ill. Professor of Surgery, Chicago Polyclinic; Attending Surgeon, Alexian Brothers' Hospital, St. Luke's Hospital, and Maurice Porter Hospital for Children.

1895. HARTE, RICHARD H., M.D., *Recorder*, 1503 Spruce Street, Philadelphia. Associate Professor of Surgery, University of Pennsylvania; Surgeon to the Pennsylvania Hospital, and Orthopedic Hospital and Infirmary for Nervous Diseases; Consulting Surgeon to St. Mary's, St. Timothy's, and Bryn Mawr Hospitals.

1898. HEARN, W. JOSEPH, M.D., 1120 Walnut Street, Philadelphia. Clinical Professor of Surgery, Jefferson Medical College; Visiting Surgeon to the Philadelphia Hospital; Consulting Surgeon to the Phœnixville General Hospital.

1899. HORWITZ, ORVILLE, M.D., 1721 Walnut Street, Philadelphia. Clinical Professor of Genito-urinary Diseases, Jefferson Medical College; Surgeon to the Philadelphia Hospital; Consulting Surgeon to State Hospital for Insane and Hayes Mechanics' Home.

1901. HUNTINGTON, THOMAS W., A.B., M.D., 350 Post Street, San Francisco, California. Professor of Clinical and Operative Surgery, Medical Department, University of California; Visiting Surgeon to the City and County Hospital, San Francisco; Consulting Surgeon, St. Luke's Hospital, San Francisco. *Vice-President*, 1906.

ELECTED

1901. JACOBSON, NATHAN, M.D., 430 South Salina Street, Syracuse, N. Y. Professor of Surgery, College of Medicine, Syracuse University; Surgeon to St. Joseph's Hospital.

1901. JOHNSON, ALEXANDER B., M.D., 12 East Fifty-eighth Street, New York. Professor of Clinical Surgery, Cornell University Medical College; Attending Surgeon to New York Hospital.

1905. JOHNSON, ROBERT W., A.B., M.D., 101 W. Franklin Street, Baltimore, Md. Professor of Principles and Practice of Surgery, Baltimore Medical College; Surgeon to Maryland General Hospital, Church Home and Infirmary, and St. Agnes' Hospital.

1896. JOHNSTON, GEORGE BEN, M.D., 405 East Grace Street, Richmond, Va. Professor of the Practice of Surgery and of Clinical Surgery in the Medical College of Virginia; Surgeon to the Old Dominion Hospital; Consulting Surgeon to the Richmond City Free Dispensary. *President*, 1904; *Member of Council*, 1907.

1901. JONAS, A. F., M.D., 454 Brandeis Building, Omaha, Nebraska. Professor of Surgery, Omaha Medical College; Surgeon to the Methodist Episcopal Hospital and to the Douglas County Hospital. *Vice-President*, 1906.

1899. KAMMERER, FREDERIC, M.D., 51 East Sixty-sixth Street, New York City. Professor of Clinical Surgery, Cornell Medical College; Surgeon to the German and St. Francis' Hospitals, New York.

*†1880. KEEN, WILLIAM WILLIAMS, A.M., M.D., LL.D., HON. F.R.C.S. ENG. and EDIN., 1729 Chestnut Street, Philadelphia. Emeritus Professor of the Principles of Surgery and of Clinical Surgery in the Jefferson Medical College; Surgeon to the Jefferson Medical College Hospital; Consulting Surgeon to the Woman's and St. Agnes' Hospitals; Membre Correspondant Etranger de la Société de Chirurgie de Paris; Membre Honoraire de la Société Belge de Chirurgie. Ehreunitglied der Deutschen Gesellschaft für Chirurgie; Honorary Member, Clinical Society of London. *President*, 1898; *Vice-President*, 1892; *Member of Council*, 1899–1901.

1901. LA GARDE, LOUIS A., M.D., United States Soldiers' Home, Washington, D. C. Professor of Military Surgery, New York University and Bellevue Hospital Medical College; Major and Surgeon United States Army.

ELECTED

1901. Le Conte, Robert G., A.B., M.D., *Secretary*, 1530 Locust Street, Philadelphia. Surgeon to the Pennsylvania, the Children's, and the Bryn Mawr Hospitals.

1908. Lothrop, Howard Augustus, A.M., M.D., 101 Beacon Street, Boston, Mass. Assistant Visiting Surgeon, Boston City Hospital; Instructor in Surgery, Harvard Medical School.

1903. Lutz, F. J., A.M., M.D., 3337 Lafayette Place, St. Louis, Mo. Professor of Surgery, Medical Department, St. Louis University; Surgeon-in-Chief, Alexian Brothers' Hospital; Surgeon-in-Charge, Josephine Hospital.

1901. McArthur, L. L., M.D., 4415 Drexel Building, Chicago, Ill. Professor of Clinical Surgery, Post-Graduate Medical School; Assistant Professor of Clinical Surgery, Rush Medical College; Surgeon to St. Luke's and Michael Reese Hospitals.

1896. McCosh, Andrew J., B.A., M.D., 16 East Fifty-fourth Street, New York. Surgeon to the Presbyterian Hospital; Clinical Lecturer on Surgery, College of Physicians and Surgeons.

1882. McGraw, Theodore A., M.D., 73 Case Street, Detroit, Mich. Professor of Surgery in the Detroit Medical College; Surgeon to St. Mary's and Harper Hospitals. *Vice-President*, 1896.

1903. McMurtry, Lewis S., A.M., M.D., 1912 Sixth Street, Louisville, Ky. Professor of Gynecology and Abdominal Surgery, Hospital of Medicine, Louisville, Ky.

1901. MacDonald, Willis G., M.D., 27 Eagle Street, Albany, New York. *Vice-President*, 1907.

1908. Mackenzie, Kenneth A. J., M.D., L.R.C.P., and L.R.C.S. Edin., 908 Corbett Building, Portland, Oregon. Professor of Operative Surgery, Medical Department Oregon State University; Surgeon St. Vincent's Hospital, Portland, Oregon.

1904. MacLaren, Archibald, M.D., B.S., 350 St. Peter Street, St. Paul, Minn. Professor of Clinical Surgery, University of Minnesota.

1906. MacMonagle, Beverly, M.D., 1316 Sutter Street, San Francisco, Cal. Surgeon to the Children's Hospital; Consulting Surgeon to the German Hospital.

*†1880. Marks, Solon, M.D., 136 Wisconsin Street, Milwaukee, Wis. Surgeon to St. Mary's Hospital. *Vice-President*, 1898.

1898. Martin, Edward, M.D., 1506 Locust Street, Philadelphia. Clinical Professor of Surgery, University of Pennsylvania and Woman's Medical College, Philadelphia; Surgeon to Philadelphia, St. Agnes', and Howard Hospitals.

ELECTED

†1895. MASTIN, WILLIAM MCDOWELL, M.D., Northeast corner of Joachim and Conti Streets, Mobile, Ala. Surgeon to the Mobile City Hospital.

1895. MATAS, RUDOLPH, M.D., 2255 St. Charles Avenue, New Orleans, La. Professor of Surgery, Medical Department, Tulane University; Professor of Clinical Surgery, New Orleans Polyclinic; Surgeon to Charity Hospital; Consulting Surgeon to the Eye, Ear, Nose, and Throat Hospital. *Vice-President*, 1901.

1903. MAYO, CHARLES H., M.D., Rochester, Minn. Surgeon to St. Mary's Hospital.

1899. MAYO, WILLIAM J., A.M., M.D., F.R.C.S. EDIN., LL.D. TOR., 427 West College Street, Rochester, Minn. Surgeon to St. Mary's Hospital. *Vice-President*, 1903.

*†1880. MEARS, JAMES EWING, A.M., M.D., LL.D., 1535 Land Title Building, Philadelphia. *President*, 1893; *Recorder*, 1881–93.

1901. MEYER, WILLY, M.D., 700 Madison Avenue, New York. Professor of Surgery in the New York Post-Graduate Medical School and Hospital; Attending Surgeon to the German and New York Skin and Cancer Hospitals; Consulting Surgeon to the New York Infirmary for Women and Children.

1893. MIXTER, SAMUEL JASON, S.B. (Massachusetts Institute of Technology), M.D. (Harvard), 180 Marlborough Street, Boston. Surgeon to Massachusetts General Hospital and to Carney Hospital; Consulting Surgeon to the Massachusetts Charity Eye and Ear Infirmary; Instructor in Surgery in the Harvard University.

1896. MONKS, GEORGE HOWARD, A.B. (Harvard), M.D. (Harvard), M.R.C.S. ENG., 67 Marlborough Street, Boston. Junior Visiting Surgeon, Boston City Hospital; Lecturer on Surgery, Harvard Medical School and Harvard Dental School.

1895. MOORE, JAMES E., M.D., 704 Pillsbury Street, Minneapolis, Minn. Professor of Surgery, University of Minnesota; Surgeon-in-Chief to the Northwestern Hospital. *Vice-President*, 1905.

1904. MUDD, HARVEY G., M.D., 2604 Locust Street, St. Louis, Mo. Professor of Fractures and Dislocations and Clinical Surgery, Medical Department, Washington University; Surgeon to St. Luke's Hospital; Consulting Surgeon to the St. Louis City Hospital.

1906. MUMFORD, J. G., M.D., 29 Commonwealth Ave., Boston, Mass. Instructor in Surgery, Harvard Medical School; Visiting Surgeon to the Massachusetts General Hospital.

ELECTED

1900. MUNRO, JOHN C., M.D., 173 Beacon Street, Boston. Instructor in Surgery, Harvard; Professor of Surgery, Tufts College Dental School; Assistant Visiting Surgeon, Boston City Hospital. *Vice-President*, 1905.

1902. MURPHY, JOHN B., A.M., M.D., 100 State Street, Chicago, Ill. Professor of Surgery, Medical Department of Northwestern University, Chicago Post-Graduate School and Hospital, and Chicago Clinical School; Attending Surgeon to Mercy Hospital, Cook County Hospital, and Wesley Hospital; Consulting Surgeon to the Alexian Brothers' Hospital and Hospital for Crippled Children.

1898. MURRAY, FRANCIS W., M.D., 32 West Thirty-ninth Street, New York City. Professor of Clinical Surgery in Cornell University Medical College; Surgeon to the New York and St. Luke's Hospitals.

1882. DE NANCRÈDE, C. B. G., A.M. (University of Pennsylvania), M.D., LL.D. (Jefferson), *President*, 1908, 720 South University Avenue, Ann Arbor, Mich. Professor of Surgery in the University of Michigan; Professor of Surgery, Dartmouth Medical College. *Vice-President*, 1889 and 1899.

1903. NEILSON, THOMAS R., M.D., 122 South Seventeenth Street, Philadelphia, Pa. Surgeon to the Episcopal Hospital and to St. Christopher's Hospital for Children; Clinical Professor of Genito-urinary Diseases in the University of Pennsylvania.

1900. OCHSNER, A. J., B.S., F.R.M.S., M.D. ENG., 710 Sedgwick Street, Chicago. Professor of Clinical Surgery, College of Physicians and Surgeons; Surgeon-in-Chief of Augustana and St. Mary's Hospitals.

1900. OLIVER, J. C., M.D., 628 Elm Street, Cincinnati, Ohio. Dean and Professor of Operative Surgery, Miami Medical College; Surgeon, Cincinnati, Presbyterian, and Christ Hospitals.

1905. OVIATT, CHARLES W., M.D., 500 Algoma Street, Oshkosh, Wis.

†1882. OWENS, JOHN E., M.D., 1017–18 Venetian Building, Chicago, Ill. Professor of Principles and Practice of Surgery and Clinical Surgery in the Chicago Medical College; Surgeon to St. Luke's Hospital. *Vice-President*, 1900.

1899. PARHAM, FREDERICK WILLIAM, M.D., 1429 Seventh Street, New Orleans, La. Professor of General, Clinical, and Operative

ELECTED

Surgery on the Cadaver, New Orleans Polyclinic; Surgeon to Charity Hospital; Consulting Surgeon to Eye, Ear, Nose, and Throat Hospital.

1885. PARK, ROSWELL, A.M., M.D., 510 Delaware Avenue, Buffalo, N. Y. Professor of Surgery in the Medical Department of the University of Buffalo; Surgeon to the Buffalo General Hospital; Consulting Surgeon to the Fitch Accident Hospital. *President*, 1900; *Vice-President*, 1893; *Member of Council*, 1893–94, 1901–03.

1893. PARMENTER, JOHN, M.D., 519 Franklin Street, Buffalo, N. Y. Professor of Anatomy and Clinical Surgery in the Medical Department of the University of Buffalo; Surgeon to the Sisters of Charity, Erie County, Fitch, Children's, and Emergency Hospitals; Assistant Surgeon to the Buffalo General Hospital.

1908. PECK, CHARLES HOWARD, M.D., 30 West Fiftieth Street, New York City. Associate in Surgery, Columbia University; Attending Surgeon to French Hospital; Junior Attending Surgeon to Roosevelt Hospital.

1889. PILCHER, LEWIS S., A.M., M.D., LL.D. (Dickinson), 145 Gates Avenue, Brooklyn, N. Y. Professor of Clinical Surgery in the Post-Graduate Medical School, New York; Surgeon to the Methodist Episcopal Hospital, New York. *Vice-President*, 1893.

1904. PORTER, CHARLES ALLEN, A.M., M.D., 254 Beacon Street, Boston, Mass. Assistant Surgeon to the Massachusetts General Hospital; Instructor in Surgery, Harvard Medical School.

†1887. PORTER, CHARLES BURNHAM, A.M., M.D. (Harvard), 5 Arlington Street, Boston, Mass. Professor of Clinical Surgery in Harvard University; Surgeon to the Massachusetts General Hospital. *Vice-President*, 1892.

1896. POWERS, CHARLES A., A.M., M.D., *Treasurer*, Fourteenth and Stout Streets, Denver, Col. Professor of Surgery in the University of Denver, and Surgeon to the Denver City and County Hospital, and to St. Luke's Hospital; Consulting Surgeon to the Mercy Hospital and to the State Home for Children. *Vice-President*, 1903; *Member of Council*, 1908.

1908. PRIMROSE, ALEXANDER, M.B., C.M. EDIN., M.R.C.S. ENG., 100 College Street, Toronto, Canada. Surgeon to the Toronto General Hospital and to the Hospital for Sick Children, Toronto; Associate Professor of Clinical Surgery in the University of Toronto.

ELECTED

1886. RANSOHOFF, JOSEPH, M.D., F.R.C.S. ENG., 19 West Seventh Street, Cincinnati, Ohio. Professor of Anatomy in the Medical College of Ohio; Surgeon to the Cincinnati and the Good Samaritan Hospitals.

1887. RICHARDSON, MAURICE HOWE, A.B., M.D., 224 Beacon Street Boston, Mass. Moseley Professor of Surgery in Harvard University; Surgeon to the Massachusetts General Hospital. *President*, 1902; *Vice-President*, 1897; *Secretary*, 1894–96; *Member of Council*, 1904.

1901. RIXFORD, EMMET, B.S., M.D., 1795 California Street, San Francisco, Cal. Professor of Surgery in Cooper Medical College; Surgeon to City, County, and Lane Hospitals. *Vice-President*, 1905.

1882. ROBERTS, JOHN B., A.M., M.D., 313 South Seventeenth Street, Philadelphia. Professor of Anatomy and Surgery in the Philadelphia Polyclinic; Surgeon to the Methodist and Jewish Hospitals. *Vice-President*, 1888 and 1894; *Treasurer*, 1892–93.

1898. RODMAN, WILLIAM L., A.M., M.D., 1904 Chestnut Street, Philadelphia. Professor of the Principles of Surgery and Clinical Professor of the Principles and Practice of Surgery and Clinical Surgery in the Woman's Medical College, Philadelphia; Professor of Surgery, Medico-Chirurgical College, Philadelphia.

†1882. RUSHMORE, JOHN DIKEMAN, M.D., 129 Montague Street, Brooklyn, N. Y. Professor of Surgery in the Long Island College Hospital; Surgeon to the Brooklyn, St. Peter's, and the Eye and Ear Hospitals.

1902. SHEPHERD, FRANCIS J., M.D., 152 Mansfield Street, Montreal, Canada. Professor of Anatomy and Lecturer on Operative Surgery in McGill University, Montreal; Senior Surgeon to the Montreal General Hospital.

1905. SHERMAN, HARRY M., A.B., M.D., A.M., 2210 Jackson Street, San Francisco, Cal. Professor of Surgery in the University of California; Surgeon to St. Luke's Hospital, San Francisco; Orthopedic Surgeon to the Children's Hospital, San Francisco.

1895. SOUCHON, EDMOND, M.D., 2403 St. Charles Avenue, New Orleans, La. Professor of Anatomy and of Clinical Surgery, Tulane University; Surgeon to Charity Hospital; Consulting Surgeon to the Eye, Ear, Nose, and Throat Hospital. *Vice-President*, 1899

ELECTED

1900. TAYLOR, WILLIAM J., M.D., 1825 Pine Street, Philadelphia. Surgeon to the Orthopedic Hospital and Infirmary for Nervous Diseases, and to St. Agnes' Hospital; Consulting Surgeon to the West Philadelphia Hospital for Women.

†1885. THOMPSON, J. FORD, M.D., The Rochambeau, Washington, D.C. Professor Emeritus of Surgery, Medical Department, George Washington University.

†1882. TIFFANY, LOUIS MCLANE, A.M. (Cantab.), M.D., 831 Park Avenue, Baltimore, Md. *President*, 1895; *Member of Council*, 1883–89; 1896–97.

†1882. VANDER VEER, ALBERT, A.M., M.D., PH.D., 28 Eagle Street, Albany, N. Y. Dean of Albany Medical College; Professor of Didactic Abdominal Surgery and of Clinical Surgery in the Albany Medical College; Consulting Surgeon to St. Peter's Hospital; Attending Surgeon to the Albany Hospital. *President*, 1905; *Vice-President*, 1898; *Member of Council*, 1907.

1902. VAUGHAN, GEORGE TULLY, M.D., 1718 I Street, Washington, D. C. Professor of Principles and Practice of Surgery, Georgetown University; Professor of Surgery and Genito-urinary Surgery, Washington Post-Graduate Medical School; Chief Surgeon, Georgetown University Hospital; Surgeon, Emergency Hospital; Consulting Surgeon, Government Hospital for the Insane, Washington, D. C.; Assistant Surgeon-General U. S. Public Health and Marine Hospital Service.

1891. WALKER, EDWARD W., M.D., 30 Garfield Place, Cincinnati, Ohio. Professor of Surgery, Miami Medical College.

†1882. WARREN, JOHN COLLINS, M.D., LL.D. (Jefferson), HON. F.R.C.S. ENG. 58 Beacon Street, Boston, Mass. Professor of Surgery in Harvard University; Surgeon to the Massachusetts General Hospital. *President*, 1896; *Vice-President*, 1890; *Member of Council*, 1897.

1896. WATSON, FRANCIS SEDGWICK, A.B., M.D., 92 Marlborough Street, Boston. Surgeon to the Boston City Hospital; Instructor in Genito-urinary Surgery, Harvard Medical School.

1889. WEEKS, STEPHEN H., M.D., 662 Congress Street, Portland, Maine. Emeritus Professor of Surgery in the Medical School of Maine; Surgeon to Maine General Hospital. *Vice-President*, 1903; *Member of Council*, 1893.

ELECTED

†1889. WEIR, ROBERT F., A.M., M.D., HON. F.R.C.S. ENG., Cor. Mem. Surg. Soc., Paris, 11 East Fifty-fourth Street, New York. Professor of Surgery in the College of Physicians and Surgeons, Columbia University; Surgeon to the Roosevelt Hospital. *President*, 1899; *Member of Council*, 1893–1896; 1901–03.

1892. WHARTON, HENRY R., A.M., M.D., 1725 Spruce Street, Philadelphia. Surgeon to the Presbyterian, Children's, and Methodist Hospitals.

1882. WHITE, J. WILLIAM, M.D., PH.D., 1810 South Rittenhouse Square, Philadelphia. John Rhea Barton Professor of Surgery in the University of Pennsylvania.

†1882. WILLARD, DE FOREST, A.M., M.D. (Univ. of Pa.), PH.D., 1901 Chestnut Street, Philadelphia. Professor of Orthopedic Surgery in the University of Pennsylvania; Surgeon to the Presbyterian Hospital; Consulting Surgeon to the Germantown Hospital; the Atlantic City Hospital; the Jewish Hospital; the Phœnixville Hospital; and the South Mountain Hospital. *President*, 1901; *Recorder*, 1893–1900; *Member of Council*, 1901–04.

1901. WOOLSEY, GEORGE, M.D., 117 East Thirty-sixth Street, New York City. Professor of Anatomy and Clinical Surgery, Cornell University; Surgeon to Bellevue Hospital, Associate Surgeon to the Presbyterian Hospital.

SENIOR FELLOWS.

ALLIS, OSCAR H., M.D., 1604 Spruce Street, Philadelphia, Pa.
BARTON, JAMES M., M.D., 1337 Spruce Street, Philadelphia, Pa.
BRADFORD, E. H., M.D., 133 Newberg Street, Boston, Mass.
CARMALT, WILLIAM H., M.D., 87 Elm Street, New Haven, Conn.
CHEEVER, D. W., M.D., 557 Boylston Street, Boston, Mass.
CONNER, P. S., M.D., 215 West Ninth Street, Cincinnati, Ohio.
GAY, GEORGE W., M.D., 665 Boylston Street, Boston, Mass.
HALSTED, WM. S., M.D., 1201 Eutaw Place, Baltimore, Md.
KEEN, W. W., M.D., 1729 Chestnut Street, Philadelphia, Pa.
MARKS, SOLON, M.D., 136 Wisconsin Street, Milwaukee, Wis.
MASTIN, WM. M., M.D., Northeast corner Joachim and Conti Streets, Mobile, Ala.
MEARS, JAMES EWING, M.D., 1535 Land Title Building, Philadelphia, Pa.
OWENS, JOHN E., M.D., 1201 Venetian Building, Chicago, Ill.
PORTER, C. B., M.D., 5 Arlington Street, Boston, Mass.
RUSHMORE, John D., M.D., 129 Montague Street, Brooklyn, N. Y.
THOMPSON, J. FORD, M.D., 1401 H. Street, N. W., Washington, D. C.
TIFFANY, L. MCLANE, M.D., 831 Park Avenue, Baltimore, Md.
VANDER VEER, A., M.D., 28 Eagle Street, Albany, N. Y.
WARREN, J. COLLINS, M.D., 58 Beacon Street, Boston, Mass.
WEIR, ROBERT F., M.D., 11 East Fifty-fourth Street, New York, N.Y.
WILLARD, DE FOREST, M.D., 1901 Chestnut Street, Philadelphia, Pa.

HONORARY FELLOWS.

ELECTED.

1905. BILLINGS, JOHN S., M.D., 40 Lafayette Place, New York, N. Y.

1891. BRYANT, THOMAS, ESQ., F.R.C.S. ENG., 65 Grosvenor Place, Grosvenor Square, W., London.

1891. CHIENE, JOHN, F.R.C.S. EDIN., M.D. EDIN., 26 Charlotte Square, Edinburgh, Scotland. Professor of Surgery in the University of Edinburgh.

1885. CZERNY, PROF. DR. VINCENT, 25 Sophien Strasse, Heidelberg, Germany. Professor of Surgery in the University of Heidelberg.

1890. HORSLEY, SIR VICTOR ALEXANDER HADEN, F.R.C.S. ENG., 25 Cavendish Square, W., London.

1894. KOCHER, PROF. DR. THEODOR, Professor of Surgery, University of Berne, 25 Villette, Berne, Switzerland.

1885. LISTER, LORD JOSEPH, F.R.C.S. ENG., D.C.L., LL.D., 12 Park Crescent, London, N. W. Professor of Clinical Surgery in King's College.

1894. MACEWEN, SIR WILLIAM, M.D., Mast. Surg., 3 Woodside Crescent, Glasgow, Scotland.

1908. MOYNIHAN, B. G. A., M.S. LOND., F.R.C.S., 33 Park Square, Leeds, England. Surgeon to the Leeds Infirmary.

1903. ROBSON, A. W. MAYO, M.D., F.R.C.S., D.Sc., 8 Park Crescent, Portland Place, London, W., England. Vice-President, Royal College of Surgeons of England; Hunterian Professor of Surgery and Pathology.

1882. SMITH, STEPHEN, A.M., M.D., LL.D., 574 Madison Avenue, New York. Professor of Clinical Surgery in the University Medical College of New York; Surgeon to the Bellevue and St. Vincent's Hospitals. *Vice-President*, 1890.

1896. TERRIER, DR. FELIX, 11 Rue de Solferino, Paris, France. Professor of Operative Surgery in the Faculty of Medicine of Paris; Surgeon to the Hôpital Bichat.

REPORT OF THE COMMITTEE ON NECROLOGY.

FRANCIS HARTMAN MARKOE, M.D.

Francis Hartman Markoe, the second son of the late Dr. Thomas Masters Markoe, was descended from a French Huguenot family, which took refuge on the Island of St. Croix, in the Danish West Indies, and who emigrated and settled in Philadelphia, Pa., before the Revolutionary War, and afterward came to New York. He was born in New York City on March 20, 1856, where he received his early education in private schools, and later went to Holbrook's Military Academy, at Sing Sing, N. Y., from which he entered Princeton College, where he was graduated in 1876. He began his medical career at the College of Physicians and Surgeons in his native city, where the degree of Doctor of Medicine was conferred upon him in the year 1879, he being one of the "honor" men in his class.

He won an interneship at the New York Hospital, on the surgical side, early in 1879, which appointment he filled, and completed his course in December, 1880. Immediately after this, in 1881, he went abroad, studying German and perfecting his medical studies at Vienna, Paris, Munich, Heidelberg and other medical centres, only to return to New York to take up the general practice of medicine in partnership with his father. In this same year he was appointed Assistant Demonstrator of Anatomy at the College of Physicians and Surgeons, which position he held for four years, when he became Demonstrator, and continued in that capacity until the year 1887. For three years he was Clinical Lecturer on Surgery, and was then promoted to the position of Professor of Clinical Surgery, which he held until his death. Among other appointments held by him were those of Attending Physician to the Nursery and Child's Hospital and Assistant to the Out-patient Departments of the New York and Roosevelt Hospitals. From 1882 to 1883 he was connected with the Board of Health of the City of New York as Assistant Sanitary Inspector. In 1887 he received his first surgical appointment as Attending Surgeon of Bellevue Hospital, which was followed by his appointment as Attending Surgeon of St. Luke's Hospital in the year 1889, which latter position he held until his death.

In 1899 he was appointed Attending Surgeon to the New York Hospital, and from 1894 he was Consulting Surgeon to the Orthopædic Hospital.

With a large general practice together with his surgical work, he found little time to devote to the many Medical Societies of which he was a member, such as The Physicians' Mutual Aid Association, The Society for the Relief of Widows and Orphans of Medical Men, The Academy of Medicine, The New York State, County, and City Medical Societies, The Surgical Society, The Pathological Society, The Clinical Society, The American Surgical Association, and The Medical and Surgical Society.

When at home his leisure hours were devoted to the art of music, of which he was a great lover, and he acquired considerable skill as a performer on the violin, which was one of his favorite instruments and gave him intense pleasure; he also read extensively, and gave much time and attention to the study of genealogy. His vacation was usually taken in the winter months, and when away on one of his trips he was particularly fond of fishing and shooting, being a member of the Narrows Island (of North Carolina) Shooting Club. He was also a member of the St. Andrew's Golf Club, but rarely had time to indulge in the pastime.

The social clubs of which he was a member were, the Metropolitan, the Union, the Princeton, the University, and the Century.

On March 9, 1882, he married Madeleine Shelton, to whom were born two children, the first, a girl, dying in infancy. The second child, Francis Hartman Markoe, Jr., still survives him, and is at the present time a student at Oxford University.

The following quotation from the appreciation published by the Century Association summarizes fittingly his leading characteristics: "His was that rare gift which does not seek, but has thrust upon it, the finest friendships and perfect trust. An accomplished musician, he had the fellowship of those who love and appreciate beauty; outdoor life on sea and land claimed his leisure, and he was ardent in the sports which gave him relaxation from the arduous tasks of a profession in which he shrank from no decision, however momentous. Stricken with mortal and lingering disease in the prime of his life, he set his house in order with a calm resolve borne of hope and an heroic spirit. To many in this assemblage his company in hours of ease was a delight, to more he was a support in the sorrows and anxiety of domestic life; some of our society were his pupils, and all were glad in association or acquaintance with him."

JOHN HILL BRINTON, M.D.

In the death, on March 18, 1908, of John Hill Brinton, the American Surgical Association lost from among the last of its Original Fellows one who in every relation of professional life—on the battlefield or in the hospital, in the editor's study or in the lecture hall, in the operating room or at the patient's bedside, or in his daily walk among his brother surgeons—was the uncompromising representative of the highest ideals of his profession. In private life, in the lovable and dignified character of a gentleman of the old school, he was the embodiment of simple kindliness, unflinching integrity, and unselfish devotion to the interests of others. With him passes away one of the last of the foremost figures in the small body of surgeons associated with the organization of the medical and surgical service of the Civil War.

Dr. Brinton was born in Philadelphia, at his family home, Fifteenth and Chestnut Streets, May 21, 1832. In 1846 he entered the University of Pennsylvania, from which he was graduated in 1850, and from which, in 1901, he received the honorary degree of LL.D.

In January, 1848, he matriculated as a medical student at the Jefferson Medical College, and in 1852 received the doctor's degree. Immediately after graduation he spent the ensuing year at the medical schools of Paris and Vienna with his future brother-in-law, the late Prof. J. M. Da Costa. In April, 1853, he returned to Philadelphia and entered general practice. In 1859 he was elected one of the surgeons to St. Joseph's Hospital, to which institution, as one of the consultants, he was attached until death.

In August, 1861, Dr. Brinton, having passed the examination of an Army Medical Board at Washington, was commissioned by President Lincoln as a brigade surgeon of volunteers. He was ordered to report to Brigadier-General U. S. Grant, who had just assumed the command of the District of Cairo and its dependencies, and was assigned to duty in the office of the medical director of that district. Later he was appointed acting medical director in the field, and served on the staff of General Grant at Cairo and at the battle of Belmont, Mo. Later, as medical director of the Army of the Tennessee, with the rank of Major, he accompanied General Grant in the campaign of 1862 on the Tennessee and Cumberland Rivers.

In the early summer of 1862, after the appointment of Assistant

Surgeon William A. Hammond, U. S. A., as Surgeon-General of the Army, Dr. Brinton was ordered to Washington and assigned to duty in the office of the Surgeon-General, where, in June following, he was ordered to prepare the *Surgical History of the Rebellion*, one of the most monumental surgical records of modern times.

After outlining and beginning this great work he was, a few months later, directed to undertake a similar labor of equal magnitude and importance, the founding of an Army Medical Museum. Dr. Brinton visited the headquarters of armies in the field and various hospitals, collecting data and illustrations for the *Surgical History of the War*, and specimens for the Army Museum.

After two years of such service he was ordered to report to the Assistant Surgeon-General at Louisville, by whom he was assigned to duty in the Department of Missouri. Later he served as superintendent and director of general hospitals at Nashville, Tennessee, and afterward as acting medical director of the Army of the Cumberland.

By reason of this close personal friendship with General Grant, Dr. Brinton's service in the Rebellion probably assumed a wider range than fell to the lot of any other civilian officer. Dr. Brinton was also a first cousin of General George Brinton McClellan.

At the close of the war Dr. Brinton returned to Philadelphia and resumed practice. Shortly afterward he became Lecturer on Operative Surgery in Jefferson Medical College, and was elected one of the surgeons to the Philadelphia Hospital. In 1877 he was appointed Surgeon to the Jefferson Hospital, and in March, 1882, on the retirement of Prof. Samuel D. Gross, he was elected Professor of the Practice of Surgery and Clinical Surgery, the duties of which he actively discharged until his resignation, to be honored by the trustees as Emeritus Professor, in May, 1906.

For many years until his death Dr. Brinton was Chairman of the Mütter Museum Committee of the College of Physicians of Philadelphia, and he was also one of the Founders of the Pathological Society of Philadelphia and of the Philadelphia Academy of Surgery. He belonged to the American Philosophical Society, the Sons of the Revolution, the Loyal Legion, the Society of Colonial Wars, and the Historical Society of Pennsylvania.

This brief sketch of the bare outward facts in this long and noble life will serve to give some idea of that extraordinary variety of experience and responsibility which went to the building of a notable character in the American surgical world.

As a military surgeon Dr. Brinton's genius for hospital organization enabled him to render to his country services of far-reaching extent and importance, and these often won for this overmodest public servant

the highest tribute of praise, publicly expressed by those prominent in the councils of the nation, as well as by the deep and loyal affection of the first soldier of the country.

As Founder of the Army Medical Museum, and first among the authors of the *Surgical History of the War*, his work established the model for succeeding military records, and is the enduring monument of the accuracy of his observations, his unflagging energy, and his capacity in military organization.

As a clinician he long stood among the foremost of a distinguished company, and as a clinical lecturer he added to a natural gift of teaching those rare personal qualities which make a man listened to because he is loved, and loved because he is listened to.

This union of executive faculty, professional skill, and wide personal sympathy filled his days with the fruits of service which remain alive, now that he is gone, wherever a pupil is profiting by his skill and as long as the great war record he collected is consulted by the student of medicine and surgery.

His name lends high honor to this great association which he helped to found. His memory will long be cherished by those who carry on the work which he began.

NICHOLAS SENN, M.D.

NICHOLAS SENN, surgeon, pathologist, teacher, and patriot, died January 2, 1908, in Chicago. Senn was born in Switzerland, October 31, 1844. He came to this country with his parents in 1852, and settled in Wisconsin. He received his early education at the high school at Fond du Lac. In 1865 he began the study of medicine and graduated at the Chicago Medical College in 1868. In 1877 he went abroad and studied at the University of Munich, where he received a degree in 1878. He then located in the city of Milwaukee, and practised there until 1893, when, after being called to the Chair of Surgery at Rush Medical College, he moved to Chicago. In 1897 he was President of the American Medical Association, and in 1892 President of the American Surgical Association. He began his career as a teacher in 1884 as Professor of Principles and Practice of Surgery in the College of Physicians and Surgeons in Chicago; in 1888 he was made Professor of Principles of Surgery and Surgical Pathology in Rush Medical College, and in 1891 was made Professor of Practice of Surgery and Clinical Surgery in that institution.

He was an indefatigable worker; he did a prodigious amount of operating in both hospital and private practice, and devoted an enormous amount of time to teaching medical students, and many hours to writing text-books and medical articles. For years, especially while he lived in Milwaukee, he worked far into the night in experimental surgery on animals. During the last few years of his life he devoted much time to writing books describing his extensive travels. His work on the Surgery of the Pancreas and on Intestinal Surgery was epoch-making.

His ingenious use of hydrogen gas as a means of diagnosis in wounds of the alimentary tract, and the introduction of the bone plates for anastomosis, although they have since been discarded in the march of progress, were important steps forward in the development of abdominal surgery.

Senn took an active interest in military surgery. He was for years Surgeon-General of the State of Illinois, a volunteer in the War of 1898, and took an active part in the Cuban campaign. Senn was a most prolific contributor to medical literature. Among his most important writings are his text-books on *Experimental Surgery*, *Intestinal Surgery*,

Surgical Pathology, Principles of Surgery, Tuberculosis of Bones and Joints, Genito-urinary Tuberculosis, Pathology and Surgical Treatment of Tumors, and *Practical Surgery.*

Senn was not only a great surgeon, experimenter, and teacher, he was also a philanthropist and public benefactor. He gave to the medical profession of Chicago a magnificent collection of books known as the Senn Collection, which are now in the John Crerar Library. He gave to Rush Medical College, to build a clinical laboratory building, $75,000. This building is now known as the Senn Memorial, and he gave $15,000 to establish a Fellowship in Surgical Pathology. Senn devoted his life to surgery. His surgical genius was the result of his own originality and of enormous labor. The position which he won is that of being one of the foremost men in medicine that America has given to the world.

A. D. B.

THOMAS ANNANDALE, M.D., D.C.L., F.R.C.S., Ed. and Eng.

In the death of Thomas Annandale, Regius Professor of Clinical Surgery in the University of Edinburgh his Alma Mater loses one of her most distinguished sons, Edinburgh one of her most respected and best loved citizens, and the American Surgical Association its Senior Honorary Fellow.

Thomas Annandale was born in Newcastle in 1838. Early in life he developed an interest in the work of his father, a Newcastle surgeon and a friend of Lister. He often went to the Newcastle Infirmary, and witnessed his first surgical operation when he was only fifteen years of age. This made a great impression upon him, and quite possibly influenced him in the choice of the profession of which he was destined to become such a distinguished member.

He entered the University of Edinburgh in 1856, and graduated in 1860, receiving a gold medal for his thesis on "The Injuries and Diseases of the Hip-joint." In 1859 he became a member of the Royal College of Surgeons, of England.

Immediately after graduation he was selected by Professor Syme as one of his House Surgeons, and Syme was so much pleased with his work that a year later he invited him to become his assistant, which position he held for nine years.

His abilities and genial qualities were quickly appreciated, and his rise in his profession was rapid. Three years after graduation he became demonstrator of anatomy under Professor Goodsir, and began to lecture on Systematic Surgery in the Extra-Mural School.

His enthusiasm as a teacher soon secured for him a position in the Edinburgh Royal Infirmary as assistant surgeon, and at the comparatively early age of thirty-three years he was made full surgeon. This position gave him command of an abundance of clinical material and the opportunity to exercise his remarkable talents as an operator and clinical teacher.

In 1874 Mr. Annandale married the eldest daughter of the late Mr. William Nelson, the publisher, and has left a widow, three sons, and three daughters.

In 1877, when Lord Lister resigned his position in the Royal Infirmary and went up to London, Mr. Annandale was appointed Regius Professor in Clinical Surgery in the University of Edinburgh, which position he held up to the time of his death.

Although not a voluminous writer, he published a number of articles of more than usual interest. Among these may be mentioned articles

on: "The Malformations, Diseases, and Injuries of Fingers and Toes, and their Surgical Treatment;" "Surgical Appliances and Minor Surgery;" "Abstracts of Surgical Principles;" "Pathology and Operative Treatment of Hip-joint Disease;" "Diseases of the Breast;" "Value of Dependent Position of Head in Operations on the Mouth and Throat;" "On Some Injuries of the Elbow-joint;" "On the Operative Treatment of Popliteal Aneurysm."

He also contributed to the development of the method of cutting away the sac in the radical cure of hernia. To him we are also indebted for the idea of opening the knee-joint in cases of detached and misplaced menisci.

Mr. Annandale belonged to that old school of vigorous men who have made the Athens of Scotland noted as a medical and surgical centre.

As a diagnostician he had few equals; his tactus eruditus was wonderfully developed. He had not cultivated the more elaborate laboratory methods, perhaps, as fully as some, nevertheless his errors in diagnosis were few; it was sometimes remarked that he seemed to recognize obscure conditions intuitively.

In the performance of major operations he was always cool, and is said never to have lost his quiet, clear judgment, even under the most trying circumstances. He was equally at home in plastic surgery and the operations requiring the finer dissection.

Mr. Annandale was a successful teacher—not as scientific as some, but clear, forceful, and practical. He was beloved by his students. Mr. Annandale's influence on the student body was always good. The imparting of information and the training in modern up-to-date methods of work is an important part of a teacher's duty, but not the whole. Mr. Annandale taught his students to be gentlemen. He took the greatest possible interest in their sports, and by his tact and untiring energy contributed largely to the building of their Union and the acquirement of the University field at Craiglockhart. He stood for manliness, truthfulness, fidelity, and good fellowship. His kindness of manner came from a kindness of heart. He saw the best in his students and encouraged them in their work.

Mr. Annandale was most hospitable, and at his home one was sure to meet interesting and charming people.

"He was operating as late as 5 P.M. of the day preceding his death, and at 10 P.M., a few hours before his death, he was telephoning to the Infirmary to arrange his work for the next day." He was found dead in his bed a little after 7 A.M. the following day.

His funeral was one of the largest seen in Edinburgh for many years, and showed the warm appreciation of the dead surgeon and the high esteem in which he was held.

G. E. A.

PROF. DR. FRIEDRICH VON ESMARCH.

In the death of Friedrich von Esmarch the surgical world has lost one of its most brilliant members, and the world at large a benefactor and a friend. Untiring in his efforts to minimize the sufferings of humanity, and conscientious and thorough in teaching others to do the same, von Esmarch's life has been an example, and his death a calamity.

Born in Tollen, in Schleswig-Holstein, he from his earliest youth dedicated himself to the study of medicine, and from the first his genius was recognized, and he was called upon to occupy positions of responsibility and trust.

The wars originating in a desire for a United Germany caused him to enlist, and thus he was afforded an opportunity of seeing the great need of improvement in field surgery, and his quick intuition and power of reasoning enabled him to see how much could be done to ameliorate the sufferings of the wounded.

Many works on the subject, such as his *Kriegschirurgische Tecknik*, were the result of these observations made on the battlefield, and his writings on the treatment of gunshot wounds and the bloodless method of operating through the medium of bandages have long been world renowned. As an operator, Esmarch was brilliant and at the same time careful and clean, and his fame gradually spread throughout Europe, through the medium of the many who had come to him for help and found it.

Of a genial, sympathetic personality, he was the idol of those with whom he was associated. In January, 1854, he married the daughter of Stromeyer, under whom he had studied, and who was always a devoted friend.

In 1874, when the news of Lister's discovery of antisepsis became public, von Esmarch hastened to Edinburgh, being interested in everything that promised benefits to humanity.

His works are too well known, as also the many positions of honor which he filled with such credit to himself and benefit to others, to need enumerating here, and it is pleasant to know that he was so thoroughly appreciated by his fellow citizens and by his sovereign during his lifetime that honors were heaped upon him, and that his native town honored him by the erection of a monument.

Having lost his first wife, he later married the Princess Henriette von

Schleswig-Holstein, with whom he lived happily until the end of his illustrious career, when death came to him quietly and painlessly.

The American Surgical Association realizes that it has sustained a great loss in the death of Friedrich von Esmarch, an honorary member of the body.

N. B. C.

ADDRESS OF THE PRESIDENT.

SOME OF THE RECENT DEBTS WHICH MEDICAL SCIENCE OWES TO SURGERY.

By WILLIAM H. CARMALT, M.D.,
NEW HAVEN.

Would it not be well for the Association to have a rule, or, at least, an understanding that the Committee on the Nominations for Officers should consult with the Council, before making their nominations, and thereby have the Association avoid the anachronism of electing for its President a Fellow who, at the same meeting, is laid upon the shelf by the Council?

Is one labelled by the Council as of the "sere and yellow leaf" the proper one to represent an association of the most progressive surgeons in America? Is the "lean and slippered pantaloon" of the poet to address, as it were with authority, those "eager for the fray?" Hence, while I can but appreciate in the highest degree this the crowning honor of a quiet and uneventful surgical life, I feel most keenly that there are many of my audience more deserving of recognition for work done and results achieved, and who would do greater justice to the duty which the position exacts.

It is now a few months beyond the half century since the speaker began the study of medicine; and although the subject is trite it is impossible for one who has for that length of time practised medicine, and for three-fifths thereof taught surgery, not to reflect upon the differences and the amazing progress that has

been made, not only in the art, but in the science of surgery—for it has become such now more than ever before.

At that time specialism was regarded with disfavor; those who allowed themselves to be, or were so designated, were thought of as approaching dangerously near to the border line of quackery; were looked upon askance; and although the term is allowed now to be used without reproach, and many and great advances are recognized as being made by the devotion of individuals to a particular line of study, nevertheless we are continually meeting with baneful effects from specialism, in the narrowing of the horizon of those who confine themselves to a single line of practice, and to feel that it oftentimes runs rampant to the border of licentiousness. Indeed, the laity follow the lead to such an extent that frequently most absurd, even dangerous practices are indulged in by persons otherwise intelligent; as an instance I have but recently known shows, and most of you have undoubtedly known of even worse, where a gentleman of great learning, under the care of his family physician for months for positive but somewhat obscure renal disease, without informing this physician that there was anything at fault with his vision, also consulted an ophthalmologist for ocular symptoms, not telling him either that his kidneys were under suspicion. The ocular symptoms were not clear either, and these two physicians went on for some weeks investigating this patient simultaneously, neither knowing what the other was doing or that there were at the same time both ocular and renal complications; each in itself obscure, but taken together capable of explanation and understanding.

It was in order to emphasize the interdependence of the different specialties that, with the initiation in this Association by our honored colleague, the late Dr. Claudius H. Mastin, the preliminary steps were taken for the formation of the Congress of American Physicians and Surgeons, which has been so conspicuously the means of bringing together, every three years, most of the principal special associations of the country, for the purpose, as it states, of presenting and discussing "scientific subjects selected with reference to their general interest." The

evidence appears clear that the object for which the Congress was inaugurated has been largely attained.

In our own Association the tone is distinctly that the operative part, per se, is regarded from a much higher point of view and the field correspondingly widened. While perfection of technique is, as it must be, regarded as of absolute necessity, the objects sought in every operation, viz.: (1) The life, relief from suffering, or improvement in health of the individual, and (2) the increase in knowledge, are more and more emphasized, so that we now consider percentages of results instead of reports of individual cases. We speak of the contributions of surgery to the elucidation, or consideration of a particular disease—the end-results of some particular line of surgical procedure. Last year's symposium was on the "End-results Following Operations for Carcinoma of the Breast." One of the topics considered at the Congress of last year was, "A Consideration of the End-results in Benign Lesions of the Stomach, Surgically Treated." Again, "The Contributions of Surgery to a Better Understanding of Gastric and Duodenal Ulcer." This afternoon we are to discuss still further one of the above subjects, *i. e.*, "Late Results after Operations for Benign Diseases of the Stomach and Duodenum," all of which shows that the trend of thought recognizes the underlying principle always to be borne in mind, but too often ignored, that a surgical operation is to be looked upon as an incident in the course of treatment, which has become a necessity because other means have failed. Indeed, it is perfectly fair to say that a surgical operation, per se, is a confession of failure. A failure because some other less mutilating procedure has not sufficed for cure. We would not amputate breasts if we could cure them with condurango or *x*-rays; we would not do gastro-enterostomies if the stenosis of the pylorus could be as satisfactorily relieved otherwise; and so on *ad infinitum;* and the judgment and acumen of the surgeon is now prized not only for the technical skill, invaluable and essential as it is, but still higher for that knowledge which guides to the decision of when to operate, if, from necessity, an operation must be, and when to let alone.

A glance over the titles to the papers on the present program

shows the tendency to generalization; to establish principles rather than particular procedures; and it has been a long time since I have heard the expression used by a surgeon that the operation was successful, but the patient died. No operation is successful if the patient dies. No matter from what cause he dies. If he dies from shock, we do not correctly estimate his powers of resistance, or omitted, or did not properly apply, a remedy; if the anesthetic kills him, there is an error in judgment for which we are responsible, and the operation is not a success. If the ether develops an acute nephritis, we have failed; if it causes a pneumonia, there has been an error in an important technique; and if we expect to advance our science we should make honest acknowledgment.

This broadening of our field carries with it, of necessity, the study of the processes of disease; the surgeon becomes the pathologist and the physiologist. In times past he has always been the advanced thinker, and, beyond all, the experimenter and demonstrator: witness William Harvey and John Hunter, both surgeons; witness in our own time the great founder of this Association, writing, in 1835, the first treatise in the English language on Pathological Anatomy; witness, in 1853, Sir James Paget's Surgical Pathology, and later, in the same decade, Billroth's Surgical Pathology, both of which, however, by their breadth of thought and comprehensiveness of detail, of vastly more than surgical significance.

I am tempted, in this connection, to quote from an address by Professor Hans Chiari, delivered at the Seventy-second Meeting of German Naturalists and Physicians in 1900, on "Pathological Anatomy of the Nineteenth Century and its Influence upon External Medicine," in which he says: "The surgeon and the practitioner of individual specialties of external medicine made the greatest progress in the diagnosis of disease by knowledge of pathological anatomy, especially in infectious diseases whose excitor was more frequently recognized; also in tumors and in numberless other diseases. The distribution and course of diseased processes was investigated further, so that prognosis became more definite and the indications for therapeutic attack more accurate; the processes of repair and regeneration were cleared up; and, thanks to

the simultaneous development of antiseptic and aseptic technique, the boundaries of operative surgery became enlarged to a previously unimagined extent.

"But the 'Externist' held not only a receptive position in relation to the pathological anatomist, but pursued pathological studies himself with great eagerness, rivalling therein the more distinctive pathologist; especially so the surgeon in the domain of tumors and bone diseases. In certain especial fields of external medicine . . . the clinician was indeed the pathological anatomist of that particular part. It is an interesting circumstance that many clinicians in external diseases, as well as internists, took up their especial line of work after having served as pathological anatomists; thereby each, according to his understanding, laid out a valuable foundation for his later clinical activity. It is, therefore, quite clear how that surgery during the nineteenth century has been advanced by the great strides in pathological anatomy during the same period, and it is to be hoped that in the future the mutual advances of pathological anatomy and practical medicine will celebrate still further triumphs to the benefit of mankind."

While the advances in surgery, speaking in the narrower sense, have been so immense in almost every line that to attempt to enumerate, let alone describe, them would occupy many times over the time at our disposal, besides being an already twice-told tale in nearly every direction, I have thought it well to refer briefly to some of the situations where surgery in the immediate past has demonstrated its claim to have advanced knowledge in general medicine; to reverse, indeed, Professor Chiari's view of the relation of surgery to pathological anatomy and show that modern surgery has been the means to develop knowledge in pathological anatomy; to mention, or charge up, some of the debts which scientific medicine owes to surgery.

If any Fellow of the Association has not yet read Dr. T. Clifford Allbutt's address on the "Historical Relations of Medicine and Surgery," delivered at the St. Louis Congress, in 1904, he should do so, for not only will he have the pleasure of reading a most delightfully written discourse, but he will leave the perusal with a

much higher sense of the position which surgery holds in the process of the development of the science of medicine than is usually given it; and if he will, in conjunction therewith, read the "Annals of the Barber Surgeons, London," he will find how much more scientific the surgeons were, in their methods of advancement in their art, than the physicians of that day, who, while regarding surgeons as of inferior professional rank, were nevertheless bound to the relics of tradition, and lost in the obscurities of vague speculation, until instructed in anatomy by the surgeons. We read how "in the early part of the reign of Edward II . . . the barbers, having been accustomed to assist the *monks* in the surgical operations performed by them in early times, acquired a degree of proficiency which enabled them to practise as surgeons themselves. Up until about the twelfth century the practice of surgery and medicine was, however, almost wholly confined to the clergy, who seem to have enjoyed the double privilege of curing men's bodies as well as their souls. In 1163 the Council of Tours, under Pope Alexander III, considering that a practice which involved in its operations the shedding of (human) blood was incompatible with the holy office of the Clergy, forbade them to interfere in any matter of surgery. . . . No doubt the Edict of Tours was hailed with joy by the barbers, who thus found a lucrative practice thrown in their way, and seized the opportunity of practising as surgeons 'on their own account,' calling themselves barber-surgeons, and practising both barbery and surgery;" and those annals show the gradual development of the art, from the assistant to the monk, to the independent and self-reliant surgeon, in that he prepared himself by the study of anatomy, making surreptitious dissections on human bodies and experiments on living animals, demanding for his own protection the passing of examinations, and obtaining licenses to practise until they made themselves known as the advanced investigators and astute thinkers of the two branches of the healing art of medicine. But the subject is too fascinating; will lead too far a-field to allow it to be pursued further. I must refer you to the Annals themselves and return to the order of the day.

Surgery has, however, come to the fore in showing the great advances in medical science during the lives of some of us. Many remember, undoubtedly, Sir James Simpson's memorable paper on "Hospitalism," wherein the mortality in surgical operations between hospitals and private practice was emphasized to the disadvantage of the former; arguing strenuously against hospitals as being unsafe places in which to practise surgery. Today we all know that the best results of surgery are obtained in properly appointed hospitals; that they are sought for and utilized by all classes: the well-to-do, the millionaire, as well as the pauper; though it is but a few years since the distinguished President of the Massachusetts State Board of Health, Dr. Henry P. Walcott, remonstrated to me against the elaborateness and expense of our hospital appointments (appliances), on the ground that we were giving to the pauper and the degenerate an unfair advantage over the great mass of the moderately well-to-do in the struggle against disease.

How, then, has this change been brought about? By two discoveries—anesthesia and asepsis, both distinctly surgical in character; neither alone accomplished it. Sir James' paper was written some years after anesthesia had robbed surgical operations of their extreme horrors. We could then promise our patients that they would not suffer, but, alas, could not speak with confidence of recoveries. The mortality following surgical operations in hospitals was frightful—pyemia, septicemia, hospital gangrene, erysipelas, veritably raged. Let me recall to you, what some of you perhaps heard, Professor Richard Volkmann's eloquent address before the International Medical Congress in London, in 1881, where, describing the advances in surgery for the ten years preceding, he spoke of the mortality so prevalent before the Listerian period; and asserted, in contrast to the previous 85 per cent. of fatalities following major operations, from infectious wound fevers in his hospital at Halle, that "if now a single patient dies in my wards from such causes, *it is my fault.*" We recognize that situation now, and so secure do we feel in our technique that we advise our patients to submit to operations early, saying, first, you will not suffer pain;

second, you will, in all reasonable probability, recover from the operation. With these assurances faithfully and conscientiously given, we can advise early operations, and operations for explorative purposes, that twenty-five years ago would have been unjustifiable. Not waiting, as then, as a last resort, but operating for distinctly therapeutic purposes; to counteract vicious tendencies that were leading to fatal consequences. Thereby are we enabled to study disease in its early stages, and instead of, as heretofore, considering surgical operations as almost necessarily radical and mutilating procedures, many of them are in the highest degree conservative. While one cannot regard the removal of a breast as otherwise than radical, it is also, of course, intended to be curative; but a gastro-enterostomy for benign stenosis of the pylorus, or other obstruction in the upper intestinal tract, is at once therapeutic and conservative; it reëstablishes a function that was being interfered with.

It is, at times, difficult to say to which surgeon or pathologist credit is due when referring to the advances in the surgical pathology of the present time. Gross, Paget, and Billroth were all conspicuously able operating surgeons, but searching always beyond the mere surgical technique for the causes of disease. No one except Virchow has done more than these surgeons to stimulate investigations into, or themselves to teach, fundamental pathological processes.

Prompted by the researches of Pasteur, a chemist, Lister, another surgeon, becoming convinced that the cause of putrefaction in wounds was due to the entrance therein of germs from without, pursued his investigations to counteract their effects, until he and his followers developed the incalculable benefits of antisepsis and asepsis in surgical operations, causing a transformation amounting to a revolution in the respective positions of medicine and surgery. From being ostensibly a follower, surgery took the lead in determining pathological processes; from the pathological anatomist reporting the conditions found on the postmortem table, and studying the last fatal, more or less complicated stages of disease, where cause and effect are often so inextricably mingled, autopsies *in vivo*

are established and the beginnings of pathological processes are unfolded fresh in the living subject. In neoplasmata the nature may be determined with certainty while the patient lies unconscious on the operating table, and the fitting operation based upon the examination thus made be carried out with a surety for the ultimate result that elevates our art to a science.

In no one disease is the change in the relation of physician and surgeon more striking than in tuberculosis. Thanks to Koch, by his laboratory researches establishing its microbic origin, this disease, formerly regarded as belonging solely to the internist, to be treated only by drugs and constitutional remedies, its initial local character is proved, and in many, if not most, of its forms opportunity presents itself for surgical interference in its early stages, with a definite prospect of eradicating the disease. The operations are distinctly therapeutical in aim and scope, for surgery has taught that generalization takes place from a primary focus to be attacked surgically. In every text-book of modern surgery the catalogue of organs and tissues affected by tuberculosis, to be attacked by surgical procedures, with reasonable prospects of success, is limited simply by anatomical considerations of accessibility and by early recognition, though by surgical procedures one does not necessarily mean a bloody operation. Immobilization is as much a surgical procedure as resection, and the interdependence of internal and external medicine is exemplified in the treatment of this disease. I venture the prediction that with the development of *x*-ray skiagraphs, or other technique for diagnostic purposes, surgery in the lives, and perhaps under the skilful hands, of some of my hearers will be the means of treating early pulmonary tuberculosis with even more certainty, and with a greater saving of life and time than the internist is now doing with the most approved sanitaria. Think of the change with regard to tuberculous peritonitis, now so frequently amenable to treatment distinctly surgical, when the infectious atrium is recognized and removed.

Our knowledge of the internal secretions, and particularly of those of the thyroid and parathyroid glands, has been materially, almost exclusively, advanced by the observations and investigations

of surgeons; and the names of several of the active Fellows of this Association are intimately associated with the development of this intricate subject, and the program of the present meeting is pregnant with interest. The first impulse to the study of the condition which he subsequently designed as cachexia strumipriva, was made by our honored Fellow, Professor Kocher, in noticing the later results of total extirpation of the thyroid gland for cosmetic reasons or pressure symptoms. He remarked upon the identity of the condition thus produced with that so well known in places where goitre was prevalent, of cretinism, myxedema, etc., and found (1) that these conditions were the consequences of total extirpation of the thyroid; while (2) if but a partial, even though considerable, removal were performed, the condition did not pertain. This led, naturally, to the opinion that there was a something elaborated by the gland, which, being taken directly into the blood by its own vascular apparatus, could be regarded and designated as an internal secretion, and, further, that the deprivation of this secretion gave rise to the pathological conditions mentioned; while if but a small part of the gland were allowed to perform its function, this result did not follow.

Differences between goitres were noticed early. Some were accompanied by symptoms of quite a different character than those mentioned, of which an exophthalmos was the most striking characteristic, and exophthalmic goitre was described by Graves, in 1835, as a distinct entity. It remained for surgery, however, to demonstrate that the conditions present in Graves' disease were due to an excess of the thyroid secretion, and this excess, amounting to a poison, produced the recognized symptoms of exophthalmic goitre, to which the names of thyrotoxemia or thyrotoxicosis may be given. Further observation by surgeons showed differences in the behavior of the two classes of cases toward operative interference: that while those unattended by exophthalmos would, under proper precautions, be benefited by operation, in Graves' disease operative interference was attended with great danger, which, while in the hands of the exceptionally dexterous and rapid operator might be successful, too often led to disastrous

consequences on the operating table, or immediately after, due apparently to forcing suddenly into the circulation an undue amount of the secretion, already too abundant, of the hypertrophic gland.

Again, a certain number of the operated cases developed a tetany more or less severe, not infrequently fatal, especially in those in which the total extirpation of the thyroid gland was practised, but not so often or not so severe in those in which a portion of the gland was left behind.

In 1882 Sandstrom discovered and described the little parathyroid glands lying in the fat surrounding the posterior portion of the thyroid gland. They were differentiated by structure and situation from accessory thyroids, and, little by little, surgical observations and experiences, controlled and confirmed by experimentation on the lower animals, appeared to show that removal, or the obliteration of the blood supply, of the parathyroids was the determining cause of the tetany following operations presumably or ostensibly only on the thyroid gland; that their removal, or the retention of their secretion (whatever it may be) in the blood, as demonstrated when the parathyroid arteries are tied off intentionally (Geis), or cut off inadvertently in removing the thyroid, induces a hypoparathyreosis or status parathyreoprivus (Halsted), of which the characteristic symptom is tetany, more or less pronounced, occasionally fatal. This, an entirely new discovery, was brought about by the careful observations and close reasoning of surgeons of the John Hunter type; and the work of William S. Halsted, Charles H. Mayo, George W. Crile, and Harvey Cushing, active members of this Association, together with those of Theodor Kocher and Victor Horsley, Honorary Fellows, will always be recognized in this connection. The physiologist and pathologist must acknowledge that they owe the most of their knowledge of the causation of tetany to the labors and intellectual acumen of surgeons. The normal histology of these bodies seems to be fairly well described, but many details of their physiology and pathological anatomy are still open fields for investigation, and while it is unsafe to prophesy, "onless ye know," it is certainly not a far-

fetched thought to anticipate that the pathogeny of many of the clinical forms of tetany, now classed under the most diverse heads, with all sorts of hypotheses as to their causation, may resolve themselves into abnormalities or diseased processes in these glandulæ or their vascular supply.

The etiological relationship between inflammations of the pancreas and the biliary apparatus, is a field in which recent surgery has taught the pathologist and clinician much of value. Until the surgeon by early operations had shown the beginning of the secondary processes, the bearing of infections of the gall-bladder and ducts to pancreatitis was unknown; indeed, almost the whole domain of the infections of the biliary passages was a *terra incognita* until the surgeon blazed a trail for the pathologist.

It is appropriate to recall here also the paper read to this Association last year on "Diverticulitis of the large intestine," which marked a distinct increase in our knowledge of the pathological anatomy of the sigmoid, necessarily carrying with it a great deal better understanding of the means to combat the disease, together with an infinitely more accurate prognosis.

With this meagre presentation of a few of the instances in recent years, and conspicuously by this Association, where general medicine is indebted to surgical progress, I beg a few minutes more to urge the claims of surgery to greater facilities for study along these lines. Probably every member of this body holds a hospital appointment. There are but few who do not feel, almost daily, the inadequacy of the facilities at their command to thoroughly investigate, by laboratory methods, the pathological processes with which they have to do. Most of us are handicapped in this particular. Every hospital should have its pathological department fully equipped with every laboratory facility for diagnosis as well as for the investigation and demonstration of diseased processes. So much has been said recently on this matter that little more can be added; but it has been borne in upon me most profoundly, from a comparatively long hospital experience, that this is at present the greatest shortcoming in our hospital equipment. One has but to look over the work emanating from the various hospitals through-

out the country to realize that those having the most complete laboratory facilities are those from which the most instructive and advanced ideas come, and I may say the best results in practice.

Hospital directors or trustees find it difficult to appreciate this feature of hospital management; most of them regard anything that does not directly (according to *their* light) concern the immediate welfare of the individual patient as unnecessary expense, a waste of trust funds. In their sympathy for the individual sufferer they lose sight of the benefit to the community, which comes from increase in knowledge. They have been forced to understand the advantage, necessity rather, of an aseptic operating room, and spend large sums in making it complete. It looks well; it impresses the public; astounding operations are successfully performed; it is good; but the laboratory does not appeal in the same way or to the same sense. The work is hidden (mysterious); there is no striking or, to them, evident result, or it is too remote to be understood; it is a fad, has no practical utility, etc. It is to them something of a confession that the attending staff do not know as much as they should. They say, you hold your position to cure the sick, not to investigate; they forget that medical science is, and must be to the end of time, progressive. Then, again, laboratories are expensive: they mean salaries instead of the voluntary service the trustees are too apt to expect and, indeed, demand from their attending staff; they mean costly apparatus; they mean running expenses by no means light; yet with it all they are worth the cost many times over; they are essential to every up-to-date hospital giving the proper stimulus to the attending staff in the completion of their work. The joy of knowledge that comes to the scientific surgeon who has the opportunity to study the details of the pathological process with which he has been dealing, and to have demonstrated at first hand, as it were, the reason for success or non-success; the knowledge from which comes the power to overcome obstacles while they are, alas, not often recognizable factors to the usual trustee, are nevertheless the compensation and reward the staff are seeking, and *to which they are entitled* by the trustees for their otherwise uncompensated labors.

From a strictly economic standpoint the union of medical school, with its necessary laboratory equipment, and hospital would seem to work to the best advantage. The educational function of a hospital is then recognized, and the best results secured. The presence of a class of medical students is the best possible stimulus to the mental activity of an attending physician or surgeon, who is compelled to discuss the pros and cons of an intricate case with them; active in mind, fresh from their books and laboratories, critical of authorities, eager for knowledge, comparing clinical symptoms with laboratory findings in which they themselves have perhaps participated, their presence is an inspiration which inevitably redounds to the benefit of the patient and the hospital.

In this matter of the highest utilization of a hospital it has seemed to me further that it would be possible to elaborate a plan by which *all* senior students in small classes in relays could be given clinical instruction on individual cases in any hospital accessible; the attending staff becoming in fact and name clinical professors in a recognized medical school. The plans would have to vary in different localities, but it does not appear to me an impossible scheme, and if carried out faithfully would add greatly to the interest of the work everywhere and surely be of benefit to the hospital in spurring men up to work now too often perfunctory. The attending staff should be taught that every hospital has a distinct educational function beyond that of their own personal experience.

In presenting these desultory reflections upon matters that have suggested themselves to me as illustrating some of the contributions to the science of medicine that have been brought about in recent years mainly through surgical procedures, I beg to reiterate my appreciation of the high honor you have accorded me in selecting me to preside over your deliberations, the program of which presents topics of very great interest to surgical advancement.

REMINISCENCES OF THE EARLY DAYS OF THE AMERICAN SURGICAL ASSOCIATION.

By JAMES EWING MEARS, M.D.,
PHILADELPHIA.

THE title of my paper presents an opportunity of speaking, in a reminiscent way, of the beginning days of the Association, of placing on record some of the notable events which have occurred in the first quarter of a century of its existence, and of indulging in some reflections on the influence it has exerted upon surgical science in this country, and on its development and growth in the future. It is impossible to speak of the foundation and early days of the Association without paying deserved tribute to the great Surgeon, its Founder, Samuel D. Gross, who in such marked manner has impressed his character upon it.

In undertaking the task which is thus imposed, I am moved to express some hesitation, since, without formal consent, I have assumed to speak for those who, with me, constitute the survivors of the number, forty-four in all, who, in the year 1880, signed the Constitution and became the original Fellows of the Association: P. S. Conner, W. W. Keen, and Solon Marks.

An intimate association with the Founder, and the enjoyment of official position in the Association for quite twenty-five years of its active work, may enable me to perform, in manner acceptable to my co-survivors, the duty imposed.

Of my acquaintance and association with the Founder I may, I trust, with becoming propriety, speak first.

This acquaintance began when I brought to him, during the struggles of the Civil War, a letter of introduction from my father, a

physician, who had been a college mate with him in Jefferson Medical College, and who had received his degree in medicine as a member of the first class which graduated from that institution, in the year 1827, after a full two years' course of instruction of three months each, reinforced by the fiction of a year's study and apprenticeship in the office of the preceptor; mayhap, in those early days the honored and beloved family physician in the city, or the autocratic Solon of the small community, the country practitioner, the deft wielder of the venesecting lancet; the unrelenting dispenser of dram doses of the mild chloride of mercury and pint draughts of nauseous decoctions of barks and herbs; withal, the true friend, the wise counselor, the bearer of cheer and sunshine into the cheerless room of the log cabin, the sagacious medical adviser, with knowledge founded upon years of carefully observed experience, the faithful physician, to whom the night was not given for rest, nor the day for recreation, whom storm did not stay, nor balmy breezes lure from duty.

At the same time with me, making likewise his acquaintance, there came a Fellow of our Association, whose name, through the achievement of his distinguished ancestor, enriched by his own endeavors, will live forever in the history of surgery—John Collins Warren.

The acquaintance with the Founder of our Association thus begun, ripened in the succeeding years into an enduring friendship, which ended only with his life, and controlled in marked manner my professional career. Honored by his confiding friendship, I learned to know him as a man, and as his assistant in his private and public surgical practice I learned to know and appreciate him as the great surgeon, the eloquent and forceful expounder of the principles and practice of surgery in the lecture hall, the erudite author of monographs and text-books on the science and the art of surgery, and the pioneer worker and author in pathological research in this country. He was not only the fearless surgeon, but, as well, the wise physician. With him, in many cases, the knife was the "dernier ressort," brought into action only after most careful study and discriminating judgment had

made sure the need for its use, and his mind's eye had looked upon the hidden morbid condition, and had given to him a true picture of its nature. Diagnosis by exploratory operation was little, if, indeed, ever, cultivated by him, and Hogarth's artistic curves did not limit his operative procedures.

Of stalwart form, with a commanding presence and the front of Jove, he stood in the clinical arena the type of the great teacher. When inspired by the exposition of some important subject which was of paramount interest to him, and with which his mind and heart were filled, he rose to a majestic height, and the words of instruction which flowed from his lips, as the stream from the overflowing fountain, held his audience in close and charmed attention. His superiors, on such occasions, he had not—his equals, if such existed, were, indeed, few. "Hier stehe ich, ich kann nicht anders." Words which, with him, as with the great Reformer who gave them birth, gave expression to the resolute convictions which inspired his opinions and guided his teachings. A tireless worker, his day from early morn was given to ceaseless work, and in his office library he burned to the dregs the midnight oil. "Nulla dies sine linea," was the legend of his life, and it guided him to the last days of his years. With becoming deference the writer feels he can place on record words spoken on the day before death came to him. "I have yet work to do. Why should I die?" Overwhelmingly absorbed as he was in work, he yet gave time to much needed relaxation in social amenities. The doors of his hospitable home were ever open to members of his profession from all parts of the country, and to distinguished men of learning from all parts of the world. He appreciated, to the fullest extent, the value of this social intermingling of members of the profession, as a means of promoting interchange of thought and the study of individual character, and he desired to make it a prominent feature of the Association he founded.

Such is, in brief, a portraiture of our Founder. Filling the eminent position he did in our country, known as he was in the countries of the Old World, and crowned, as he had been, with the highest honors of their great institutions of learning, he, of all

others, was best qualified to bring into existence an Association which would gather together, for the cultivation of surgery, the surgeons of the country, prominent as authors, teachers, and skilled practitioners. He designed it to be a school for mutual instruction and improvement, a court of supreme authority into which the great questions of Surgery should be brought for discussion and judgment, a gathering in social intercourse of the individual workers in surgical science. Medical politics was to be forever debarred, was to have no place in the deliberations of the organization. The great representative association of the medical profession of the country afforded a large field into which all questions affecting the "body politic" could be brought for adjudication—and were there to be left. Personal friendship was not to be the test of the qualifications of the candidate seeking admission into the association, nor personal animosities or local factional contests the bars which would shut out the eligible candidate.

Our Founder, cherishing the desire he did with regard to the formation of the Association, called about him, at the time of the meeting of the American Medical Association, at Atlanta, Georgia, in the year 1879, a few of the prominent surgeons there assembled in attendance, and disclosed to them the object which was very close to his heart. Although this meeting has taken the place in the minutes of the Association as the first, in chronological order, it was simply a meeting for conference. Its purpose was to obtain an expression of the feeling which might exist as to the desirability of forming an organization such as he contemplated, and in order that formal discussion of the subject should take place, it was duly organized by the election of a chairman and secretary. The discussion which ensued developed the fact that the sentiment was markedly unfavorable, if not positively hostile. By some, the opinion was expressed that the movement had the character of an attack upon the American Medical Association, intended to destroy its influence as a representative body of the medical profession; it would originate, they contended, a condition which, if extended to other specialties of medicine, would result in its disintegration. It was claimed that all of the objects sought to be accomplished by

such an Association could be accomplished through the Surgical Section of the American Medical Association.

Without taking any action whatever, the conference adjourned, and later, at a consultation held with friends of the project, it was decided to issue the following circular letter: "The undersigned respectfully solicit your coöperation in founding a National Surgical Society, to consist, exclusively, of distinguished surgical practitioners, writers, and teachers, and request you to attend a meeting to be held at the College of Physicians and Surgeons,[1] New York City, on Monday, May 31, 1880, on the adjournment of the meeting of the American Medical Association. Signed by, W. W. Dawson, Moses Gunn, L. A. Dugas, W. T. Briggs, and S. D. Gross."

At the place, and on the date, given in the circular letter, surgeons who had been invited assembled, and a temporary organization was affected by the election of Dr. L. A. Sayre as Chairman. In some well-chosen remarks Dr. Gross presented the object of the meeting, and then moved that an Association, such as contemplated in the circular letter, be formed. This motion was unanimously approved, and he then offered a draft of a Constitution and By-laws, to constitute the organic law of the Association, which, on motion, was adopted, and those present, forty-seven in number, signed it, paid the initiation fee, and thus became the original members of the American Surgical Society, as it was designated in the draft of the Constitution and By-Laws proposed and submitted for adoption by the Founder. The formal and perfected organization of the Association was then effected by the election of Dr. Samuel D. Gross as the first President and Dr. J. R. Weist as the first Secretary, with other officers to conduct the business affairs of the Association. It was deemed desirable to submit the Constitution and By-Laws to examination and to revision, if found necessary, and to this end a committee, consisting of Drs. John H. Packard, John Ashhurst, Jr., John H. Brinton, W. W. Keen, and J. Ewing Mears, was appointed, and instructed to report at the next meeting, which, on motion for adjournment, was ordered to be held in Richmond, Virginia, on May 5, 1881.

[1] Now Medical Department, Columbia University.—Ed.

With these ceremonies, simple in character, the American Surgical Association was brought into existence, charged with most important responsibilities as to the development and growth of surgical science in our country. By its organic law it imposed upon its members and their successors most responsible duties for the maintenance of the high standard of qualification of those who should be admitted to its Fellowship, as therein provided.

A national character was given to the Association in the list of surgeons whose names were affixed to the Constitution at this time of its organization. Among them were James R. Wood and L. A. Sayre, New York; J. C. Hutchison, Brooklyn; E. M. Moore, Rochester; Moses Gunn, Chicago; John T. Hodgen, St. Louis; T. G. Richardson, New Orleans; Claudius H. Mastin, Mobile; L. A. Dugas and Henry F. Campbell, Augusta, Ga.; R. A. Kinloch, Charleston; Hunter McGuire and James L. Cabell, Richmond; Christopher Johnston, Baltimore; W. W. Dawson and P. S. Conner, Cincinnati; David W. Yandell, Louisville; Samuel D. Gross, S. W. Gross, John Ashhurst, Jr., W. W. Keen, and T. G. Morton, Philadelphia; Solon Marks, Milwaukee; and J. R. Weist, Richmond, Indiana, all distinguished as surgical practitioners, writers, or teachers. Of these surgeons of our country at that period, of the work accomplished by them, and of the influence exerted by the Association since its organization, Dr. P. S. Conner, one time President, and one of the survivors of the original Fellows, thus writes: "I join you most heartily in appreciation of our early associates and recognition of the value of the work done and influence exerted by them. American surgery today owes much to the American Surgical Association, and our literature has been much enriched by the contributions of those who are now but a memory."

As ordered, the next meeting was held in the city of Richmond, on May 5, 1881, at which nineteen Fellows were present and no scientific business was transacted. The Committee on Revision of the Constitution and By-Laws reported several amendments, which were adopted, the most important of these consisting in the change of the name from the American Surgical "Society" to

that of the American Surgical "Association," and those constituting the membership being designated as "Fellows" instead of "Members." The initiation fee was reduced from twenty-five dollars to ten dollars, and it was ordered by vote that the difference, fifteen dollars, should be returned to those who had paid the larger sum. A subsequent alteration in the By-Laws fixed the sum at fifty dollars, where it now stands.

One surgeon who had been invited by the circular letter to participate in the organization of the Association, but who could not be present at the meeting held for that purpose in New York, was permitted to sign the Constitution as an original member, this act making the total number forty-eight. Some feeling of discouragement was manifested at the absence of any scientific business, but this was soon dissipated by the encouraging words of the President, who called attention to the fact that all scientific bodies required time to perfect an organization, and he expressed the hope that a number of papers would be presented at the next meeting. It is most interesting, as well as gratifying in the highest degree, to compare the program of the present meeting, held in the same place and within a day, on the same date in the year, with that held twenty-seven years ago. A grand total of forty papers, on the most important subjects, engaging at the present time the attention and study of the surgeon, five of which are to be read by title, find place upon the program. Moreover, the presence and active participation in the scientific proceedings of the Association of a number of distinguished surgeons from abroad give a distinction to the meeting, alike honorable and gratifying. Truly, indeed, has the prophetic vision of our Founder been verified, and fortunate are those of us who are present to witness its full accomplishment.

The meeting at Richmond adjourned to meet at Coney Island, Long Island, New York, on September 13, 1882, at which time the meeting was held, and eleven Fellows were present. Several papers were read and discussed. It became evident at this meeting that there should be provided, in order to give the character to the Association it was intended to have, a definite system with regard to the scientific business, and that a reporter should be chosen, who

should be an officer of the Association, whose duty it should be to take full and accurate reports of the scientific proceedings, to be published annually in a volume of *Transactions*. In order to accomplish these important objects, amendments to the Constitution and By-Laws were submitted by the writer, which provided that the President should, in addition to the other duties of his office, appoint at each meeting six Fellows to prepare papers for the next meeting, on subjects chosen, after consultation with the appointees, and from four to six Fellows who should discuss the propositions submitted in these papers, which were to be sent to them by the writers in ample time for consideration. The reporter was to be designated as the Recorder, and was to be a member of the Publication Committee and the editor of the volume of *Transactions*. In the twenty-five years of the life of the Association this important matter has undergone several changes and re-arrangements, the object sought for being always to provide the best method for the conduct of the scientific business of the Association—one which would invite carefully prepared papers on important subjects, not in too great number, which should receive careful discussion, in order that, through this discussion, the judgment of the Association should be rendered and published to the world. Later revisions of the Constitution relieved the President of the duty of selecting readers of papers, and placed the duty in the hands of a Business Committee. Still later revisions of the Constitution confided the subject to the Committee on Annual Meeting, which consists of two Fellows elected by the Association, with the President, Secretary, Recorder, and Chairman of the local committee of arrangements, members *ex-officio*. This matter is regarded of so much importance as to justify its record in detail.

While there were several papers, five in number, read at this meeting, and some discussion of them, there appeared to be but little enthusiasm manifested, and discouragement as to the future success of the Association was in evidence. The committee appointed to select a place for the next annual meeting was requested by Dr. S. W. Gross and the writer to name the city of Philadelphia, they feeling that in this city it would be possible to arouse interest

in the purposes of the Association, and place it upon a stable foundation. The city of Philadelphia was chosen as the place of the next meeting, and Drs. S. W. Gross, R. J. Levis, and the writer were appointed the Committee of Arrangements. At the time appointed, May 31, 1882, the Association met. There were twenty-five Fellows present, and the six Fellows appointed by the President at the last meeting read papers upon interesting subjects, which were fully discussed; in addition, two volunteer papers were read.

On taking the chair, the President delivered a short address, in which he pointed out the necessity for the founding of the Association, and denied, in earnest terms, that its organization was intended in any way to be a blow struck at the American Medical Association. He claimed that body would be strengthened by this organization, and have new life infused into it. He said: "We can hurt no association now in existence, or likely to come into existence. We can only hurt ourselves if we fail to do our duty. We hope to make the American Surgical Association an altar upon which we may annually lay our contributions to surgical science, and to show to the world that we are earnest and zealous laborers in the interest of human progress and human suffering." He called attention to the fact that the previous meetings, with the exception of that held at Coney Island, were held to perfect the organization of the Association. The program presented for the meeting promised important scientific work. He referred to the importance of the social features of the annual reunions. In this direction, the Committee of Arrangements in charge of this meeting has made ample provision. In the executive session, on the concluding day of the meeting, the Secretary was, on motion, instructed to cast an affirmative vote for fifty candidates for election as Active Fellows, and six as Honorary Fellows, whose names had been selected, after informal consultation, on the part of the Council and Committee of Arrangement. This action, which, at one stroke of the pen, as it were, extended the list of fellowship to ninety-six, within four of the constitutional limit, was an unusual procedure on the part of a scientific body. It was largely the result of the enthusiasm en-

gendered by the pronounced success of the meeting, scientifically and socially. The feeling was unanimous that the Association had been successfully launched, and had taken its place as a recognized body in the surgical world. Inspired, possibly, by the same feeling, an amendment to the Constitution was offered increasing the limit of fellowship to one hundred and fifty. This amendment was very wisely laid on the table; subsequently, on motion, it was taken from the table and ordered to lie over until the next meeting for action. The effort which manifested itself on this occasion to increase the fellowship of the Association was finally successful, a few years since, in increasing the number to one hundred and twenty-five, a happy compromise. The provision made by amendment to the Constitution for a class of Senior Fellows, in addition to the two already provided for, Active and Honorary, has given a very elastic limit to the Active Fellowship, and one which, while it will not limit the number of those eligible for active work, will keep it near to the original limit of one hundred Fellows. The intention of the Founder of the Association, with respect to the character of the organization he desired to found, was given expression too wisely in the limitation of membership incorporated in the original draft of the Constitution. He sought to secure in the fellowship of the Association qualification in the individual, not length in the roll-call. The limitation in fellowship fixed for the Association gave it at once a standard of excellence and of honorable distinction, which stimulated worthy ambition and made admission into it an honor to be sought after.

An election for officers was held, and Dr. Gross was chosen for the fifth time to fill the high office of President. The city of Cincinnati was named as the next place of meeting, which was to be held on May 31, 1883. At this meeting sixteen papers, six regular and ten volunteer, were read and discussed. The amendment to the Constitution, in order for action at this meeting, fixing the limit of Active Fellowship at one hundred and fifty, was defeated. A resolution was adopted providing for a dinner at the future meetings of the Association, to be arranged by the Committee of Arrangements and to be paid for by Fellows participating therein. This

dinner was given at a number of meetings, but was finally abandoned. The desire entertained by the Founder of the Association to include in the program of the meetings a function of this character would seem to be worthy of consideration. A formal dinner is the climax of entertainment, and is, the world over, the accompaniment of the assemblages of the eminent men composing learned bodies in art, in science, in statecraft, in commerce, and in every and all associations of men engaged in carrying on the work of the world. The function might assume, in our Association, the form of a reception, to be held by the presiding officer, which would afford an opportunity for social intercourse among the Fellows, and would not only be enjoyable, but of service in promoting good fellowship and harmony in its work.

When the time for the election of officers arrived, Dr. Gross, in a few feeling remarks, declined to be again a candidate for the office of President. He thought it very desirable, and for the best interests of the Association, that there should exist a system of rotation in the office. Such a plan would result in giving to the Association the benefit of new methods of administration, the infusion of fresh spirit into its work, the avoidance of control by routine and tradition. It was a source of great pride and gratification to him to see the Association in such a prosperous condition. He felt that the ambition he had cherished with regard to its foundation and successful beginning had been fully realized, and he wished to place into other hands the honors of office and the responsibilities of its further development and growth. That in coming years it would continue to maintain the high standard which had been fixed for it, and that it would exert always a most beneficial influence on surgical science in this country, he did not doubt. In a voice choked with emotion, he bade the Association an affectionate farewell.

In response to the words of parting spoken by the President, Dr. David W. Yandell, in most eloquent terms, expressed the feelings of regret entertained by the Fellows of the Association on learning of his decision to lay down the honors of office. His master mind, he said, had brought the Association into existence, and his master

hand had guided its progress to this period of its life. With sentiments of high esteem and affection, to which words fail to give adequate expression, he bade him, on behalf of his associates, farewell.

Dr. E. M. Moore was elected President, a few candidates for Fellowship were elected, and the Association adjourned to assemble in Washington, on April 3, 1884. It would seem appropriate to limit the chronicles of the early meetings of the Association to those over which our Founder, as the first President, presided. Some interesting events, however, transpired at the meeting which succeeded his retirement, which was held in the city of Washington on April 3, 1884, which are worthy of record. There were forty-three Fellows present, and thirty papers were presented, eighteen of which were read and discussed, and six were read by title. The number of Fellows present, and the number of papers presented, were the largest of any of the meetings yet held. At this meeting the resignations of three Fellows, two Active and one Honorary, were presented and accepted, this action being in response to the request of the Association, by reason of alleged violations of the Code of Ethics of the American Medical Association, which had been adopted and incorporated in the Constitution of the Surgical Association. Since then this clause of the Constitution has been, very wisely, expunged. An event which caused a feeling of much sadness was the illness of Dr. Gross, which unhappily proved to be his last. Desiring to give evidence of his continued interest in the scientific work of the Association, he had sent a paper, prepared in the beginning days of his illness, on "Wounds of the Intestines," which was read by Dr. T. G. Richardson, of New Orleans, one time his student. Telegrams expressive of the great regret felt by the Fellows of the Association, and of the hope of his speedy recovery, were sent to him by the President. On account of the illness of Dr. Gross, the annual banquet was omitted.

A most noteworthy event of this meeting was the presentation by the Recorder, Dr. J. Ewing Mears, of the report of the Committee of Publication, giving an account of the publication and issue of the first volume of the *Transactions of the Association*, the edition

numbering five hundred copies. This volume contained five hundred and sixty-eight pages, and included all of the papers read at the meetings held at Coney Island, Philadelphia, and Cincinnati, thirty-two in number, with the discussions, and seventeen illustrations. The cost of the volume was $1393.63. It had been distributed to the Fellows of the Association, Active and Honorary, to medical libraries in this country and abroad, complimentary copies were sent to distinguished members of the profession at home and abroad, and one hundred copies were deposited for sale. Before the binding of the volume was completed, the Recorder sent to Dr. Gross a copy of the unbound leaves, and received from him a note commending it as a volume worthy of the Association, and concluding his note with this injunction: "Don't cut the leaves," which was obeyed; and the first volume was issued with uncut leaves.

On retiring from the office of President, Dr. Moore called attention to the work the Association had accomplished during the session just completed, and pronounced it good. He felt called upon, however, to state that the provisions of the Constitution had been violated, inasmuch as thirty papers had been presented, twenty-four of which had been read in full and discussed, and six read by title; instead of only six, or two each day, as therein provided for. He earnestly recommended that in the future this clause of the Constitution be strictly complied with, since it would lead to the presentation of more carefully prepared papers and afford more time for their reading and discussion. "This," he said, "is a most important matter, and should claim the earnest attention of the Association. We desire quality, not quantity."

A feeling having been expressed that the interests of the Association would be promoted in having a permanent place of meeting, it was ordered by vote that in the future the meetings should be held each year in the city of Washington, at the time fixed on the adjournment of this session. This was done for a period covering eight years, until the year 1892, when it was decided to return to the peripatetic or itinerant method, assembling every third year in Washington, at the time of the meeting of the Congress of Physi-

cians and Surgeons. While much that is interesting and instructive is to be seen and enjoyed at the various places of meeting of the Association, crowned on the present occasion by social events of most gracious courtesy, it is an open question whether a fixed place of meeting would not contribute to a more serious execution of its business, its real business, its scientific work. One of the constituent societies of the Congress, that of the American Physicians, has adopted this plan, and, I believe, it is the custom observed generally by scientific bodies abroad.

The selection of a permanent meeting place for the Association might result in the future years of its existence in the erection in the city of Washington of a building suitable for its purposes, provided with an assembly hall, a banquet room, and other rooms for the meeting of the Council and committees intrusted with its business affairs. As years increase, the surplus volumes of our *Transactions* and the archives of the Association will accumulate, and should have quarters in which they may receive careful preservation. A movement begun at this time, the termination of the first quarter of a century of the existence of the Association, may secure sufficient funds to make a beginning. Contributions and endowments in years to come may assure the realization of the project. The advantages which will come to the Association in carrying out a plan of this character may not be fully foreseen, but that they will come would seem to be undoubted. It will give solidity and dignity to our Association to be an incorporated body quartered in a permanent abode in the capital city of our great and growing country. Should not American surgery have an imposing temple upon whose walls shall be emblazoned the names of those who in the past have been its pioneers, and who have, by their achievements, made its history, honorable above reproach and enduring in its character?

With this account of the early meetings of our Association, and of the more important events which transpired in the early days of its life, we may rest in our detailed report. In the meetings which have followed, in each year, important work has been done. Upon the subjects of surgery which have claimed the attention of

the surgical world papers have been written, discussions held, conclusions determined, and published to the world.

It will be interesting to place on record the titles of some of the papers read and discussed at the early meetings of the Association.

By Dr. Samuel D. Gross, "The Value of Early Operations in Morbid Growths."

By Dr. Samuel D. Gross, "Wounds of the Intestines."

By Dr. W. T. Briggs, "The Antiseptic Treatment of Wounds after Operations and Injuries." Read at the meeting in 1882.

By Dr. E. M. Moore, "Report of Cases Illustrating the Conditions of Luxation of the Ulna in Connection with Colles' Fractures."

By Dr. John H. Packard, "Esophagotomy without a Guide."

By Dr. Moses Gunn, "Treatment of Fractures of the Skull, Recent and Chronic, with Depression."

By Dr. R. J. Levis, "Treatment of Transverse Fracture of the Patella, with the Object of Producing Bony Union."

By Dr. J. R. Weist, "Foreign Bodies in the Air-passages—A Study of 1000 Cases to Determine the Propriety of Bronchotomy in such Accidents."

By Dr. J. C. Hutchison, "A Résumé of the Etiology, Pathology, Diagnosis, and Treatment of Morbus Coxarius."

By Dr. C. B. G. de Nancrède, "Have we Any Therapeutic Means as Proven by Experiment, which Directly Affect the Local Processes of Inflammation?"

By Dr. C. B. G. de Nancrède, "Surgical Interference in Cerebral Abscesses."

By Dr. T. G. Richardson, "The Use of the Trephine in Traumatic Empyema Associated with Thoracic Fistula."

By Dr. Basil Norris, Surgeon, U. S. A., "Dislocations of the Astragalus."

By Dr. P. S. Conner, "Excisions of the Tarsus, with a Report of Two Successful Removals of the Entire Tarsus."

By Dr. Solon Marks, "Trephining the Sternum for the Removal of a Foreign Body from the Anterior Mediastinum, with a Report of a Case."

By Dr. Henry F. Campbell, "Strictures of the Esophagus, Their Nature and Treatment with Cases."

By Dr. McLane Tiffany, "A Contribution to the History of Ligation of the Common Femoral Artery."

By Dr. B. A. Watson, "Lister's System of Antiseptic Wound Treatment versus its Modifications."

By Dr. B. A. Watson, "An Experimental Study of Anesthetics."

By Dr. S. W. Gross, "The Influence of Operations upon the Prolongation of Life and Permanent Recovery in Carcinoma of the Breast."

By Dr. S. W. Gross, "A Case of Nephrectomy for Medullary Carcinoma, and Partial Cholecystectomy for Calculus in Same Subject."

By Dr. S. W. Gross, "Gastrostomy, Esophagectomy, Internal Esophagotomy, Combined Esophagostomy, Esophagectomy, and Retrograde Divulsion in the Treatment of Strictures of the Esophagus."

By Dr. John B. Roberts, "The Localization of Perinephric Inflammation, by Means of Clinico-anatomical Study."

By Dr. J. Collins Warren, "The Healing of Arteries after Ligature."

By Dr. Nicholas Senn, "Intracapsular Fracture of the Neck of the Femur with Bony Union."

By Dr. Nicholas Senn, "Experimental Researches on Cicatrization in Bloodvessels after Ligature."

By Dr. Nicholas Senn, "An Experimental and Clinical Study of Air Embolism."

By Dr. Christopher Johnston, "Diagnostitial Laparatomy."

By Dr. Harold C. Ernst, by invitation, "A Consideration of the Bacteria of Surgical Diseases."

By Dr. Roswell Park, "A Case of Lipoma of the Testes, Weighing Four Pounds, a Successful Nephrectomy for Fibrocystic Disease of the Kidney in a Boy aged Twenty-three Months."

By Dr. J. Ewing Mears, "Closure of the Jaws and its Treatment, by a New Method of Operation."

By Dr. J. Ewing Mears, "The Intraperitoneal Method of Treating the Pedicle in Ovariotomy."

By Dr. J. Ewing Mears, "A Contribution to our Knowledge of the Pathology of Trifacial Neuralgia, with the Report of a Case in which Three Inches of the Inferior Dental Nerve were Excised, with the Suggestion, for the First Time Made, as Stated by Krause, of the Removal of the Gasserian Ganglion in Order to Obtain Permanent Relief in such Cases."

The limit in time, for the reading of papers and for discussions, has been, from time to time, a subject for decision.

At the meeting in 1885 it was moved to limit the time for the reading of a paper to thirty minutes. A motion to amend was made to limit the time to forty-five minutes, and, finally, it was moved to limit the time to one hour, which was adopted. At present the time limit is fifteen minutes; a significant change, and one open to discussion as to whether it is quite just to a writer of a paper, who has given time and work to its preparation, to be compelled, by the time limit, to stop the reading at, possibly, the most important part, and thus fail to bring the subject before the Association in proper form for intelligent and full discussion. Better, fewer papers, with ample time for their reading and discussion, than a mass not fully read nor discussed in a proper way.

A most notable event, reference to which should not be omitted, occurred in the movement which had its origin in the Association, and which resulted in the foundation of the Congress of American Physicians and Surgeons. To the zealous efforts of Dr. Claudius H. Mastin, Fellow of the Association and one time its President, the Congress owes its existence. At the meeting of the Association held in Washington, April 28, 1886, Dr. Mastin presented a communication in which it was suggested that action be taken by the Association to secure the formation of a Congress of American Physicians and Surgeons by the union of the nine special societies then existing. After the reading of the communication and some discussion of the project, a motion to lay it on the table was made, and defeated. On motion then made by the writer, the Memorial was referred to a special committee consisting of Drs. Christopher

Johnston, W. T. Briggs, and the writer, with instructions to report during the session. The Committee reported as follows: "That it views with great satisfaction the perfection of a plan through which the meeting of the special associations named in the Memorial, in the city of Washington at the same time of the year, may be accomplished, and the meeting of all of these associations in general assembly on such days as may be determined for the purpose of addresses upon the general subjects in medicine. Such meetings to be held without any formal organization through which the associations meeting will sacrifice their autonomy." The Committee presented a resolution asking for the appointment of a committee of five Fellows, authorized to confer with committees of other associations interested in the adoption of a plan of a convention, and report at the next meeting. The resolution was adopted, and Drs. Claudius H. Mastin, Charles T. Parks, J. Ford Thompson, Nicholas Senn, and the writer were appointed members of the committee.

In due time the Congress was organized, and it holds now its meetings every third year in the city of Washington. Of the great influence exerted by it upon the progress of medicine in our country there can be no question; in one organization it unites the workers in all of the special branches of medicine.

Dr. Reginald H. Fitz, President of the Congress at the last meeting, writes: "I believe in the Congress as a means of promoting acquaintance between representative men in the various parts of the country. Progress in medicine depends upon the individual worker, and encouragement comes from the Association."

Another event of special interest to the Fellows of the Association should be noted—the erection of a bronze statue of the Founder of our Association in the city of Washington. The funds necessary to accomplish this object were contributed, in part, by the Government, which not only gave the site, but appropriated $1500 for the pedestal, by the Fellows of the Association, by the Alumni Association of Jefferson Medical College, by members of the medical profession throughout the country, and by friends outside of the profession. The site of the monument, near to the Smith-

sonian Institution and to the Library of the Surgeon-General of the United States Army, is well chosen, and affords an opportunity to those who visit these depositories of scientific lore to look upon the features of one who filled an eminent position in his Profession and achieved, through his labors, enduring honors.

Our Association returns to this city, the capital of the historic commonwealth, which was the birthplace and the home of George Washington, who will ever live in the hearts of the people as the Father of his Country, to celebrate its silver anniversary. In commemoration of this happy event, its loyal sons, bearing tokens of devotion, come to pay homage at its Court, to testify in terms of congratulation to the great work it has accomplished, to honor the name it has given to American surgery, to speak for the future the words of hope, and to renew their pledges of loyalty to the promotion of its high aims.

We, the few survivors of those who began the work of the Association, bring wreaths of victory to lay upon its altar, the emblems of faith which has been well kept, of work which has been well done. For them, and in their name, we ask that the high ideals cherished by our illustrious Founder may ever control the endeavors of our Association, and be the guiding star of its destiny.

SURGERY OF THE GASSERIAN GANGLION.

By STEPHEN H. WEEKS, M.D.,
PORTLAND, MAINE.

Neuralgia of the face is of very common occurrence, and often entails an almost insupportable amount of suffering, rendering life absolutely one of incessant torture. The intermittent form of the disease, depending upon malarious influences, generally very readily yields to quinine, accompanied by a proper regulation of the diet.

The case is very different when the disease is occasioned by organic lesion of the fifth nerve, or of the Gasserian ganglion, from which the branches of the fifth nerve arise. Under such circumstances a cure can only be effected by thorough excision of the ganglion, an operation which has now been so often practised as to entitle it to be regarded as one of the established procedures in surgery. The two nerves requiring excision for neuralgia are the second and third branches of the fifth pair, which may suffer either separately or simultaneously, although the former is much more common.

It is not the province of this paper to consider the superficial neurectomies in persistent neuralgia of the head and face, other than to say that the results so far obtained in the intracranial operations do not justify the surgeon in the abandonment of the extracranial operations. The extracranial neurectomies certainly justify the expectation that they will afford great and often permanent relief. Up to this time it seems to me that every method of treatment should be exhausted before removing the Gasserian ganglion. This, although one of the most difficult operations in surgery, does insure long and often permanent immunity.

Anatomy. Both motor and sensory roots of the trifacial pass downward and forward through an aperture in the dura, which lie under cover of the tentorium cerebelli and a little to the outer side of the apex of the petrous portion of the temporal bone, to enter Meckel's space, between the supporting and periosteal layers of the dura mater, in which space the sensory portion enlarges into the Gasserian ganglion. This ganglion, of somewhat semilunar form, with convexity forward, rests in a special depression upon the anterior surface of the petrous bone, near its apex, and also to a slight

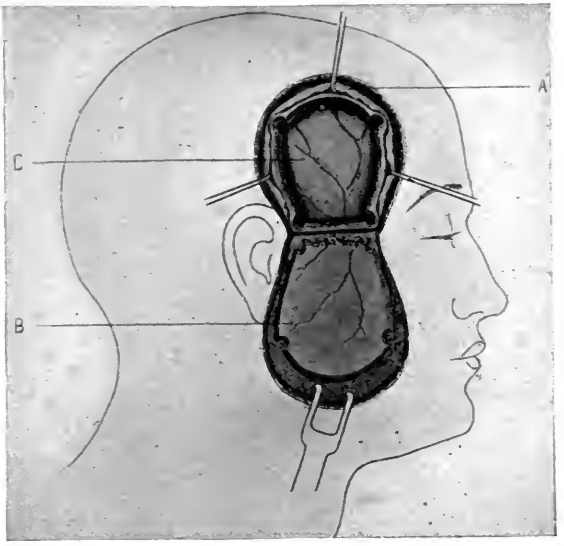

Fig. 1

extent upon the cartilage which occupies the foramen lacerum medium. Its upper surface is firmly attached to the dura (roof of Meckel's space), its lower surface less firmly to the floor of Meckel's space. Its inner part lies near the posterior extremity of the cavernous sinus and the internal carotid artery. It is important to remember the above relations, lest these important bloodvessels be wounded during the removal of the ganglion, which would give rise to troublesome hemorrhage. The motor root and the large superficial petrosal nerve lie beneath the ganglion. From its con-

vex antero-external border are given off: (1) The ophthalmic, passing out through the sphenoidal fissure; (2) superior maxillary, passing through the foramen rotundum; (3) inferior maxillary, passing out through the foramen ovale and being joined immediately after its exit by the motor root, which also passes through the foramen ovale separately.

Operation. The operation which I have always employed, and the one at present most generally used, is the intracranial extradural method of Hartley-Krause.

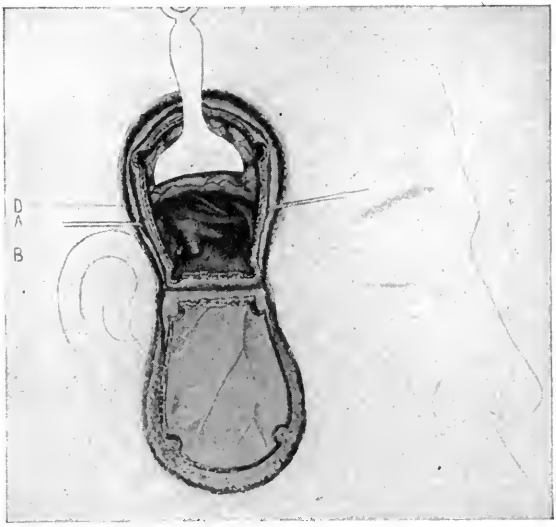

Fig. 2

Preparation of the Patient. The patient should be in bed for two or three days and kept on his ordinary diet, but not a heavy one. A careful and full examination should be made, including the heart and lungs, the pulse at each wrist, and the urine. His bowels should be moved by an aperient. It is better to give the cathartic the night but one or early in the day before that of the operation, with the object of not disturbing the patient's rest on the night immediately preceding the day of the operation. An hour before the operation a pint of normal salt solution with a table-

spoonful of brandy should be given as an enema. This will be gradually absorbed and supply the blood during the operation. It is needless for me to say that the most thorough asepsis should be observed in every detail. The day before the operation the entire scalp should be shaved and thoroughly scrubbed with soap and water and then with ether and 1 to 2000 solution of bichloride of mercury, and the head covered with sterile gauze.

The Anesthetic to be Used. Sir Victor Horsley uses chloroform in all operations on the brain, claiming there is less hemorrhage. I have always used ether, and have never had any troublesome hemorrhage. In my hands ether is much the safer anesthetic. The operation consists in an osteoplastic resection of the temporal region with temporary turning down of a flap of bone and soft parts and a separation of the dura mater from the middle fossa of the skull, the ganglion and the three divisions of the fifth nerve being exposed without opening the dura. A horseshoe-shaped incision is made over the temporal region, its anterior extremity being near the external angular process of the frontal bone, its posterior extremity near the tragus of the ear, and the highest part of the curve reaching the supratemporal ridge. The above incision passes through all the soft tissues and periosteum directly to the bone, along the entire line. With the periosteal elevator the soft parts of the flap are freed from the bone to a slight extent only, around the entire incision line, the freeing at the two ends of the base line being a little more extensive. Throughout the rest of its extent the soft parts remain adherent to the underlying bone. In my last two operations I have used a small trephine of about one-half inch in diameter to remove two disks of bone, the anterior one having its centre over the tip of the sphenoid wing, the posterior one having its centre over a point one inch vertically above the external auditory meatus. From these trephine openings the dura is separated as far as possible, both along the straight basal line connecting the two openings and in the direction in which the convex bone section is to be made. A section of bone similar in shape to the skin incision, but somewhat smaller in size, is now made. This section is made from the squamous portion of the temporal

and greater wing of the sphenoid, the basal attachment being somewhat narrower than the greatest transverse measurement of the convex portion. I am in the habit of using a special chisel, cutting a triangular groove, for making this bone section, the section beginning at one trephine opening and ending at the other, care being taken not to wound the dura. The bone being thus cut through everywhere except across its basal line, some stout instruments (such as an osteotome or elevator) is inserted into the groove at its greatest convexity, resting against the parietal bone as a fulcrum; then with sharp, sudden movement, the flap of skin, muscle, and bone is pried outward and downward, generally snapping directly and evenly across the basal line, just above the zygomatic arch, and remaining hinged by the soft parts, and exposing an area of brain, covered by the dura mater, two to three inches in diameter. If the middle meningeal artery is injured, as it sometimes is, it is tied as near the foramen spinosum as possible. If more room is necessary, the basal line of bone may be cut away to any desired extent by the rongeur forceps. The dura mater and temporosphenoidal lobe of the brain are now separated from the middle fossa of the skull. This is done in the direction toward the apex of the petrous portion of the temporal bone, and is best accomplished by the fingers. Sometimes the dura is torn, and sometimes the middle meningeal artery is ruptured, requiring temporary packing of the groove to control the hemorrhage, where ligature is impossible. The three divisions of the nerve are now seen and can be traced back from the foramina. The positions of the internal carotid artery and cavernous sinus are located as nearly as possible, for the purpose of guarding them against injury. The advisability of removing the first division is doubtful, because of the trophic changes which follow in the eye. I do not remove the ophthalmic branch, and I have had no trouble with the eye following the operation. It has been said that the motor root should be left undisturbed. I do not see how this can be done. In all my operations I have cut everything that goes through the foramen ovale, including, of course, the motor root, and I have had no paralysis of the muscles of mastication. I have found that it facilitates the operation to divide the second nerve close to the foramen

rotundum, and the third close to the foramen ovale, and dissect those back to the ganglion. After this has been done, if the divided end of the third branch be seized with the forceps and firm traction made upon it, the ganglion will be lifted from its bed, and as much of the ganglion can be cut away with the scissors as is desirable, leaving untouched the first division, with its corresponding part of the ganglion. I have never found it necessary to divide the operation into two stages. I have never found the hemorrhage at all troublesome. It has always been readily controlled by gauze packing for a few minutes. In one case I left the gauze in for twenty-four hours.

The chief dangers of the operation are injury to the internal carotid artery and cavernous sinus, laceration of the brain, injury to the nerves of the eye, hemorrhage from the middle meningeal artery, and sepsis. In the four operations which I have made none of these dangers were encountered.

After the dura mater has been separated from the middle fossa, the brain can be gently lifted from the fossa, exposing the nerves, by a special retractor which I had made. One end is made just wide enough and tapering enough to fit in between the petrous portion of the temporal bone and the lesser wing of the sphenoid, extending down to and exposing the three branches of the fifth pair.

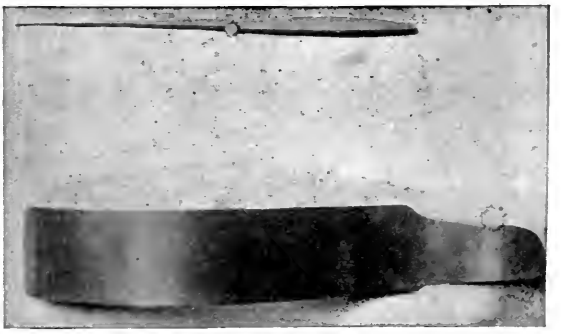

FIG. 3

I show here a photograph of the retractor. I also show a photograph of the steel hook used in making traction on the nerves before they are divided.

Report of My Last Case.

Mrs. T., aged forty-five years, married, had suffered nine years from severe neuralgia of the superior maxillary nerve. This nerve was removed in the usual manner, and she was free from the pain for three years. At the end of this time it returned, and it was decided that the best thing to be done was to remove the Gasserian ganglion.

The operation was made at the Maine General Hospital, December 5, 1907, assisted by Dr. H. H. Brock, one of the surgeons of the Hospital. The operation was made as described above, and was free from any complication or mishap. What hemorrhage there was was readily controlled by gauze pressure continued for a few minutes. The two special instruments which aid in this operation are here described and illustrated. The elevator, which is made of German silver and pointed at one end so that it shall fit in between the petrous portion of the temporal bone and the lesser wing of the sphenoid, is used to lift the brain from the middle fossa, so that the nerves and ganglion are thoroughly exposed and dealt with as desired. The second instrument is a hook of steel made with a long handle so that the nerves can be easily reached; the hook is passed beneath the nerves, which are put upon the stretch before they are divided. At the same time the nerves can be separated from their sheath of dura mater as far back as the ganglion. The superior maxillary is first divided as close to and even into the foramen rotundum. No further traction is made upon this nerve. While the inferior maxillary nerve is being put upon the stretch with the hook, the nerve is cut close to and even into the foramen ovale. Scissors with a long handle and narrow blades are used for the division of the nerves. This nerve being cut, the proximal end is seized with firm grasping forceps, and, as traction is made upon it, the ganglion is lifted from its bed and can be cut away to any desired extent. After removing the ganglion and arresting all hemorrhage, I packed the foramen rotundum and foramen ovale with Sir Victor Horsley's aseptic wax. The object I had in view in doing this was to prevent any union with the ends of the divided

nerves. After all hemorrhage had ceased the bone was replaced and the incision in the soft parts closed with catgut suture. A strip of gauze was introduced through the posterior part of the opening between the scalp and the bone for drainage. There was no drain introduced between the brain and skull. A microscopic examination, by the pathologist, of the nerves and ganglion removed showed bundles of nerve fibers cut in longitudinal and cross section, also two areas of ganglion cells. The ganglion cells were swollen and hyaline, much distorted in shape and without nuclei. The nerve fibers show their axis cylinders in many places swollen, broken, kinked, and distorted. Frequently the axis cylinder has disintegrated and disappeared altogether. There was no infiltration with round cells. Here and there a little free hemorrhage into tissue. Some hyaline changes in the epineurium. Diagnosis made by the pathologist was degeneration of the ganglion cells and nerve fibers.

The operation made on this last patient was followed by almost no reaction; temperature and pulse after the first twenty-four hours were practically normal. The patient began to sit up on the eighth day, and on the twelfth day she left the hospital and went to her home, ten miles away, riding about three miles in an open carriage. The pain was completely relieved, no impairment of motion of mastication, no trouble with her eye, but considerable loss of sensation on the side of the face corresponding with the side of the operation.

Mr. James K. Preston came to the Maine General Hospital, April 27, 1907, under the care of Dr. Wm. H. Bradford, surgeon on duty at that time. He gives the following history: Had facial neuralgia for twenty years or more, involving the right side. Nine years ago had the superior maxillary nerve removed, which gave relief for fourteen months. Two years after the first operation, the inferior dental nerve was removed. This operation was made through the mouth. The operation was followed by relief of the pain for about one year. At the time of the operation the pain involved the whole side of the face. The operation for the removal of the Gasserian ganglion was made by Dr. Bradford, May 1, 1907. The usual osteoplastic flap was made and ganglion readily

reached by raising the temporosphenoidal lobe from the middle fossa. The ophthalmic branch and its corresponding portion of the ganglion were left undisturbed. Ether was the anesthetic used, and the hemorrhage was readily controlled by gauze pressure. May 17, the right eye, corresponding to the side of operation, was closed, sight not affected. There was distinct ptosis for several weeks. This gradually passed off. The pain was wholly relieved, and he left the hospital June 7, cured, as the records say. For several weeks after the operation the mind was a good deal disturbed. This gradually passed off, and when he was discharged his mind was clear.

It has been suggested by Abbe and others, when the disease is limited to the second and third division of the nerve, to resect a small portion from these branches as they enter the foramina and leave the ganglion undisturbed, preventing reunion of the divided ends by placing a folded piece of rubber protective tissue between the divided ends or filling the foramina with paraffin.

Harvey W. Cushing exposes the ganglion by a lower incision similarly curved. The temporal muscle and zygoma are divided in the line of incision, and both turned downward, exposing the lower portion of the temporal fossa of the skull. This is broken through with a chisel and the opening enlarged with the rongeur forceps. The dura with the middle meningeal artery is gently retracted and the ganglion exposed, as in the Hartley operation. The advantages claimed for this operation are that there is little or no danger of wounding the middle meningeal artery, and as the opening in the skull is nearer the ganglion, its exposure can be accomplished with a minimum amount of retraction and compression of the brain. Ptosis, paralysis of the muscles of the eye, etc., may occur as a result of injury to the third, fourth, and sixth nerves. One may avoid these conditions by keeping away from the first division of the fifth nerve and the immediately adjacent third, fourth, and sixth nerves during the course of operation.

Summary. The operation for the removal of the Gasserian ganglion as a primary operation for the relief of tic douloureux is not justifiable. The extracrainal operations upon the branches of the

fifth cranial nerve should first be made, which almost invariably give temporary relief, and not infrequently relief is permanent. The greatest care should be used in preparing the patient for the operation, and strict asepsis should be observed through every step of the operation.

The osteoplastic flap in the temporal region, called the Hartley-Krause operation, is the one I have always made use of. A pint of normal salt solution with one ounce of brandy should be injected into the rectum about one-half hour before the operation commences. This is absorbed during the operation, and supplies, to a considerable extent, the amount of blood lost during the operation. The question of anesthesia during operation on the brain is an important one. In all my operations on the brain I have used ether as an anesthetic. Sir Victor Horsley uses chloroform only. He claims that ether causes a rise of blood pressure and an increase of blood venosity, and, therefore, much additional and troublesome hemorrhage. Chloroform, on the contrary, causes a fall of blood pressure with less blood venosity. He uses the Vernon Harcourt apparatus, by which it can be used in known quantities.

Put the second and third divisions upon the stretch with the blunt hook and divide them close to the foramen rotundum and foramen ovale, respectively, dissect them back to the ganglion, and lift the ganglion from its bed by making traction on the inferior maxillary nerve, having first divided the superior maxillary nerve, and remove the parts of the ganglion corresponding to these divisions, leaving untouched the first division, with its corresponding portion of the ganglion. If the first division of the nerve and its corresponding portion of the ganglion be retained, there will be no danger to the eye, and the only protection to the eye needed will be a simple compress and bandage. Bleeding may be so great as to compel the operator to pack and finish the operation in two stages.

Sometimes the dura mater is considerably torn, and the cerebrospinal fluid escapes during the manipulation of the brain. This has occurred several times in my experience. I have never seen any bad results follow. In fact, it has seemed an advantage, inasmuch as it has enabled me to lift the temporosphenoidal lobe more

freely from the middle fossa, thus giving a better view of the ganglion and its nerves. In my last case, when the dura was dissected from the ganglion, quite a little brain matter escaped. No unpleasant symptoms followed. My patient was sitting up in eight days, and went home on the twelfth day.

The mortality thus far in my hands has been nil. With perfect asepsis and improved technique, the mortality following this operation will be very much reduced.

DISCUSSION ON THE PAPERS OF DRS. MEARS AND WEEKS.

Dr. Maurice H. Richardson, of Boston.

In meetings of this kind, as Dr. Mears has said, the discussion partakes of the nature of a trial by jury, and it should be a full one.

The essence of these meetings lies in the discussion. If the discussion is shut off we might just as well not attend the meetings at all, but read the papers at home in our leisure.

Furthermore, statements which go forth from the Association unchallenged may be regarded as receiving the endorsement of its members as a whole, when perhaps there are many Fellows who do not approve them.

Another thing seems to me indispensable, and that is the presenting of the unfavorable aspects of a subject. I believe that the unfavorable side should receive perhaps even more attention than the favorable.

Dr. A. Vander Veer, of Albany.

Dr. Mears has presented a most thorough and accurate report of the history of the organization and life of this Association. I agree with him that no other man would have done the work or could have secured the organization that Dr. Gross did.

In connection with Dr. Weeks' paper, I should like to say that my first paper on this subject was presented at the Cincinnati meeting to which Dr. Mears referred and at which Dr. Gross presided as President. I have no great reason to change my view in regard to the operation for trifacial neuralgia that was done at that time, except that, instead of going through the external wall of the antrum, I now go through above the antrum and then follow the infra-orbital nerve. There is no harm done to the eye, and a report from a number of cases gives permanent

recovery. I have done the operation for the removal of the Gasserian ganglion several times, but the hemorrhage has always been an important element. I should like to endorse Dr. Richardson's remarks that we should have the other side of these operations that are really serious.

Dr. S. J. Mixter, of Boston.

Dr. Weeks has been fortunate in being able to do this operation in one stage. As a rule, in doing a complete operation for the removal of the Gasserian ganglion, it has been necessary for me to do the operation in two stages. Dr. Vander Veer has spoken of the value of the lesser operation. I have not removed the Gasserian ganglion lately, except in one case, and I did practically an Abbe operation. Instead of gutta-percha I use amalgam filling. I inject osmic acid into the Gasserian ganglion and into the nerves before dividing. I have had one fatal case. The osmic acid had nothing whatever to do with the issue, although that was blamed at the time. The less we do in operating upon the Gasserian ganglion the better will be our results. Cushing's operation, as reported in his brilliant cases, and that of dividing the root and bending it forward, is less serious than the removal of the ganglion. The ganglion cannot be removed without a certain amount of damage. I can do the other much more easily and do it in one stage. I think the great mistake is in trying to finish the operation and in insisting upon getting the ganglion out. If you do this you often stand a good chance of killing your patient; whereas, if the patient is allowed to wait for the completion of the operation three or four days, the result will probably be satisfactory.

Dr. Weeks. I did not read the complete report of my cases, on account of the lack of time. I have operated four times, and all the patients recovered. The ganglion is easily lifted out after dividing the first and second divisions and then the third. The patient whose case is reported was up in eight days, and left the hospital in twelve, riding several miles. When I removed the ganglion a small portion of the brain escaped. I felt some apprehension, but nothing untoward followed, and the patient made a good recovery. Since I wrote the paper, however, she came to my office and said she had some difficulty in pronouncing certain names.

PERFORATIVE PERITONITIS (GENERAL, FREE, AND SUPPURATIVE).

By JOHN B. MURPHY, M.D.,
CHICAGO.

MINUTE ANATOMY OF THE PERITONEUM.

Formerly the peritoneum was believed to be an immense closed sac, but the researches of von Recklinghausen on the rabbit, and Schweigger-Seidel, Dogiel, and others on the frog, apparently proved that this was incorrect; they believed they had discovered a connection between the peritoneal cavity and the subperitoneal tissues through minute openings in the endothelium called *stomata*. These were presumed to be the openings or mouths of the subperitoneal lymphatics (making the peritoneum a part of the lymphatic system), and were believed to be guarded by the surrounding endothelial cells, usually pictured as somewhat differentiated from their neighboring cells, which, by their property of contractility, opened or closed the stomata as the needs of the organism directed. Bodies twice the size of red corpuscles were thought to be capable of passing through these openings, gaining immediate access to the lymphatics. In addition to these, smaller openings called stigmata were described, which were variously interpreted as artefacts due to stretching or shrinking of the cells caused by the action of reagents, as precipitated stains, or as openings left by the passage of leukocytes (Muscatello); but even this writer believes an absolutely normal peritoneal endothelium would show no stigmata.

Stomata are described in most text-books of histology; they are admirably pictured, though, in a most diagrammatic manner. In

fact, most of the descriptions have been rather vague, as compared with the pictures, and it seems the whole subject is more or less a tradition handed down through the various editions of textbooks. One dislikes, however, to dismiss a basis so simple and clear for the explanation of the phenomena of absorption.

More recently Kolossow, Muscatello, MacCallum, and others have denied the existence of stomata. According to these writers the peritoneal endothelium is an unbroken layer of cells having no direct communication with the subperitoneal lymphatics. From these writings, and particularly the recent admirable and precise descriptions by MacCallum, the following may be accepted safely:

On the pleural surface may be seen, among the more or less parallel, connective-tissue bundles, large bloodvessels, nerves, and *lymphatic trunks*, which frequently appear as clear canals branching about over the surface, with especially large channels in the periphery. From these larger peripheral canals efferent trunks emerge, some passing to the anterior mediastinum and its glands, and others backward through the diaphragm emptying into the abdominal lymphatic trunks. An abundant network is formed on the pleural surface with peculiar filmy valves. Penetrating the musculature and tendinous tissue of the diaphragm are short trunks, establishing a communication with the lymphatics on the peritoneal surface, which are arranged more or less definitely in two layers; a radial arrangement of larger vessels and a parallel one of the smaller more intimately anastomosing superficial vessels. The two are, however, intimately connected. The smaller parallel canals are somewhat beaded or bulged along their course. Valves were not determined. In the peculiar interlacing of the connective-tissue bundles, between which the parallel lymphatics run, lozenge-shaped spaces are frequently left, the seat of the aforementioned bulgings in the lymphatics. Here they lie separated from the peritoneal cavity by an extraordinarily thin layer of tissue (a delicate basement membrane between the two endothelial layers), a most favorable entrance point for substances from the peritoneum, undoubtedly an especial adaptation. The endothelial lining, how-

ever, is everywhere continuous, no openings of any kind being visible or demonstrable. This basement membrane was shown to consist of a very delicate network of fibrils, in which elastic tissue was abundant, and was imperforate and homogenous except in the diaphragmatic zone, where there were minute perforations or imperfections, a condition which forces us to the conclusion that this is the ideal place for absorption of granular material. Some writers describe pits or diverticula in the diaphragmatic zone of the peritoneum, into which particles readily "fall," to be absorbed later.

From an embryological standpoint, too, we must assume that there are no stomata, for the lymphatics develop from a finger-like projection or bud of the endothelium of the subclavian veins, and have no connection with the primitive body cavity or celom. The lymphatics embryologically are, then, modified veins, and we may state that the peritoneum is not a part of the lymphatic system.

PHYSIOLOGY.

Wegner calculated that the peritoneum has an area of 17,182 square inches, approximately the same as the skin (17,502). However, the importance of the peritoneum lies not so much in its great surface as in its tremendous absorptive power, which is almost beyond belief, and can be best appreciated by referring to one of his experiments. One hour after injecting 870 c.c. of blood serum into the peritoneal cavity of a dog weighing 13,400 grams, 170 c.c. had been absorbed, equivalent to 1.3 per cent. of body weight. In rabbits, and sometimes in dogs, this was even more marked, the percentage of fluid absorbed varying from 3.3 to 8 per cent. of the body weight.

The paths of absorption have been the subject of much experimental work and subsequent discussion by investigators, with rather inconclusive results, but it seems generally accepted that both the lymphatics and the bloodvessels are concerned in the absorption of fluids and soluble substances, while solid particles

(lampblack, foreign animal cells, and bacteria) are absorbed through the lymphatics almost, if not quite, exclusively.

The most active portions of the peritoneum, as far as absorption is concerned, are the diaphragmatic and omental areas, with perhaps much the greater share of the work falling to the diaphragm.

H. D. Durham found bacteria in the lymph glands of the anterior mediastinum six minutes after injection of septic material into the peritoneum. Buxton and Torrey found inert particles in the spleen and liver as early as fifteen minutes after injection, in at first small numbers, it is true, yet sufficient to be discovered with great uniformity and in from two to four hours in great numbers. In a subsequent paper Buxton reports that the typhoid bacillus was injected into the peritoneal cavity in the "dose of one-half of an agar culture," "the number of bacilli was of the order of four thousand millions." In rabbits which were killed at once after the injection, four of seven were found to contain organs swarming with typhoid bacilli. Since only ten minutes had elapsed from the time of injection of the suspended bacilli until the animals were bled to death, the result in rapidity of absorption was astounding.

What are the paths taken by the morphological elements? Durham found the mediastinal lymphatics turgid with blood soon after the beginning of peritoneal injections. In five to fifteen minutes after the injection of lampback, Buxton and Torrey found the lymphatics in the anterior mediastinum represented by black lines, while the glands were also colored, the particles lying for the most part free in the afferent lymphatics and the peripheral sinuses of the glands. Typhoid bacilli, on the other hand, were found mostly in the macrophages,[1] a very few in the neutrophilic leukocytes (which were not as abundant as it is generally supposed that they are), and still others free, *i. e.*, in general, in the same locations as the lampblack particles. Evidently, then, these solid particles had entered the glands by way of the diaphragmatic lymphatics.

[1] A term first used by Metchnikoff to describe a cell derived from the endothelial cells of the great omentum and other situations. La Théorie des alexocytes, Ann. de l'Institut Pasteur, 1893, vii.

PHYSIOLOGY OF THE DIAPHRAGM.

We come now to the consideration of the physiological bearing of the diaphragm, the anatomy of which has been discussed. While physiologists are not agreed as to the presence or absence of stomata, experiments, especially those of Buxton and Torrey, have shown that the diaphragm is penetrated by inert particles and to a small degree by bacilli (typhoid, anthrax, etc.), and even by such large bodies as chicken corpuscles, without the aid of macrophages or leukocytes. So rapid is this that we hesitate to abandon the idea of entrance through some preformed openings like stomata.

Muscatello suggests that leukocytes in passing through the endothelium (perhaps with the vanguard of the invading particles or bacilli) leave a minute opening through which there is an immediate rush of free particles (whose motive power probably depends upon the lymphatic currents induced by the movements of the diaphragm). An analogous condition is known in the rush of red corpuscles through the walls of a bloodvessel after their penetration by a leukocyte.

MacCallum thinks that the neutrophilic leukocytes are most active in transporting inert particles through the diaphragm; his drawings show these corpuscles busily engaged entering the lacunæ, passing between and under the endothelial cells, some being pictured within the lacunæ, differing therein radically from Buxton and Torrey. The endothelial cells of the peritoneum, and even the underlying connective-tissue cells, may become phagocytic in their properties, and finally the lymphatic endothelia may be loaded with particles, undoubtedly additional adaptations to the end that rapid absorption may be effected.

The mechanism of the diaphragm, by which the lymphatic spaces are compressed when it is contracted and conversely widened when it is relaxed, represents in the main the principle of a pump. While MacCallum proved that this was not absolutely essential to absorption, he showed very conclusively, by eliminating phagocytosis of any and all cells by various means, that this action alone

was sufficient to determine a certain degree of absorption, even in a dog four days dead.

The constancy of the action of the diaphragm is another element to consider; like the heart, it is in action day and night, thus greatly augmenting its functional powers, that absorption may be accomplished.

In microscopic sections he found the free particles between and within the cells of the roofs of the lacunæ, a picture differing very little from von Recklinghausen's original one. However all this may be, the diaphragm is so constructed as to permit of ready passage of inert particles and, in varying degree, bacteria.

The omentum is also concerned very mildly in the initial rush of free particles, as shown by Buxton and Torrey. Sections of the omentum made within an hour show the afferent lymphatic plexuses filled with free granules which are taken up by the macrophages within two to three hours.

Peritoneal absorption depends upon several factors:

1. Pressure of the abdominal muscles; tonicity, and respiratory contraction.

2. Rhythmic pump-like action of the diaphragm; by virtue of its constant contraction and relaxation, fluid and particles are aspirated from the peritoneum and forced onward.

3. Peristaltic activity: Under the influence of gravity all *fluids tend* to accumulate in the pelvis. Peristalsis has, among other *functions*, that of distributing the fluids evenly and preventing their accumulation at the lowest point in the pelvis.

4. Vitality of the peritoneal endothelium. Peritoneal absorption cannot depend entirely upon osmosis, as Wegner believed.

Factors hindering absorption are:

1. Subperitoneal infiltration, lymphatic "coffer-damming."

2. Venous engorgement.

3. Diminished peristalsis, *i. e.*, in inflammations of peritoneum the fluids gravitate to the pelvis, because of the intestinal paresis.

4. Diminished or shallow respiration in lessening the diaphragmatic movement, another feature in the symptoms of peritoneal infection.

5. Lowered abdominal temperature. The muscular and nervous elements concerned in absorption are less irritable if the temperature be lowered by the local application of cold; peristalsis is then less active and the tendency for the fluid to gravitate again favored.

6. Drying of the peritoneal endothelium, *e. g.*, by exposure during an operation.

7. Lowered intra-abdominal pressure, as after a laparotomy.

8. Certain positions of the body which favor gravitation toward the pelvis.

Factors favoring absorption:

1. Abrasion or exfoliation of the endothelium will, under certain circumstances, favor absorption; it is also to be borne in mind that the phagocytic action of the peritoneal endothelium is thus destroyed.

2. Tearing of adhesions of the peritoneum, exposing the underlying vessels, increases the possibility of absorption through the blood stream.

3. An acceptable material, *e. g.*, physiological salt solution, certain bacteria, ptomaines, etc.

4. Pressure and continued contact; pus *under pressure* is readily absorbed.

5. Vasomotor paresis; toxic absorption paralyzes the vasomotor centre and a "viscous circle is established."

Protections against infection:

1. Peritoneal fluid. There can be no doubt that this fluid, small *in amount* though it is, has great bactericidal properties; it is *increased greatly*, both in quantity and in bactericidal potency, even very early in peritoneal infections.

2. Plastic powers of the peritoneum. The irritation of foreign bodies produces a local peritoneal exudate with deposition of fibrin, thus encapsulating the foreign body and rendering it harmlessly held on the surface until it can be englobed by the macrophages or neutrophilic leukocytes. It may be said that fibrin has the same role in the peritoneal cavity that the Board of Health plays in endeavoring to isolate an infection and protect the community. Pus in the peritoneum, from a clinical viewpoint, may be classified

as (*a*) defensive; (*b*) neutral; (*c*) destructive. Buxton, in several elaborately planned experiments, has thrown much light on the subject of absorption. One series of experiments applies in particular. Seven rabbits were given an intraperitoneal infection of very moderately virulent typhoid bacilli in suspension in dose "of the order of 4000 millions," and were killed at once, scarcely ten minutes elapsing from the time of injection until the circulation had ceased, as a result of bleeding the animal to death. Four of these were shown by plating methods to contain in the peritoneal cavity from 1200 to 2500 millions of organisms, and the organs (liver, spleen, bone marrow, etc.) to be literally swarming with them. The other three had in the peritoneal cavity from 1000 to 350,000 individual organisms, with just fifty-two colonies in the plates from the organs and blood. "Everything in the three cases points to a sudden, one might say explosive, destruction, which must almost certainly be due to the bactericidal action of the body fluids and not to the comparatively slow process of phagocytosis." It must be stated that it has been shown repeatedly that there is an initial leukopenia in the peritoneal fluid which lasts from one to three hours after foreign material enters the cavity, and, while the interpretation of this phenomenon varies greatly, we have in it another justification for the belief above quoted. This explosive destruction was real, for a microscopical examination of the omentum showed no organisms on its surface.

This corresponds to the destruction of bacilli *in vitro* by the body fluids, so often carried out experimentally.

If, one hour after the peritoneal cavity has been injected with lampblack, it be gently washed under the tap, the diaphragm and the omentum are found to remain black, all other areas leaving a clean peritoneal surface. If the omentum be examined under the microscope, the particles of lampblack, or if typhoid bacilli have been injected, the organisms, will be found scattered over its surface in a peculiar, net-like distribution, which is proved by Weigert's stain to be due to an enmeshing network of fibrin in which the particles have become entangled. Later, in one-half hour for typhoid bacilli, and almost immediately for lampblack (by which

this subject is most easily studied), one finds the particles englobed in the cells of the peritoneal fluid (macrophages) which are present even before the leukocytosis of the first to the third or fourth hours; indeed, they are stuffed so full that one can scarcely see the cytoplasm. Apparently the particles have been held upon the omental surface where the phagocytes can more readily devour them, being less elusive there than in a free fluid; besides, it is well known that phagocytes are more busily engaged in their policeman-like duties if they are upon a surface over which they can crawl.

Another work along this line is that of Dudgeon and Ross. In an experimental peritonitis due to the B. aërogenes capsulatus, the peritoneal fluid was found to contain 90.2 per cent. of polynuclear finely granular leukocytes, *none of which were phagocytic*, while in the great omentum there were 99.6 per cent. of the same cells, *every cell containing microörganisms*. (It is to be noted that these writers differ from Buxton in their results, showing the finely granular cells to be the more important phagocytes. The difference may depend somewhat upon the variety of microörganism used in the experiment. It will be remembered that MacCallum also differed from Buxton.)

3. Phagocytosis in the peritoneal cavity. The initial leukopenia, after injections into the peritoneal cavity, has already been spoken of. But even early, Buxton found a certain number of macrophages to contain particles and bacteria. In two or three hours the polynuclear neutrophilic leukocytes arrive in large numbers, and take up the particles with great avidity. In twenty-four hours the macrophages arrive in large numbers and englobe the "microphages" (leukocytes) and possibly, also, free particles.

4. Phagocytosis on the omentum. This has already been mentioned, but in addition another phenomenon has been observed. The omentum of young rabbits contains numerous dull, whitish opaque spots, some of which contain capillary tufts, others do not; in the full-grown rabbit all are supplied with capillaries. Under the high power objective one sees, in the former spots, cells with branching processes resembling connective-tissue cells, while apparently on the surface are a few large, round, mononuclear cells. Inter-

mediate forms are present, and one gains the impression that the latter are becoming metamorphosed into the former, at the same time penetrating more deeply into the omentum.

In grown rabbits these cells are found to have become more elongated and to have arranged themselves along the capillaries. Many contain granules, probably representing disintegrated leukocytes; Buxton and Torrey called these "trailers." They found them previously described by Ranvier as "clasmatocytes." These take active and early part in the phagocytosis of lampblack, chicken corpuscles, and typhoid bacilli.

Whether these are metamorphosed macrophages or phagocytic connective-tissue cells is of no importance from our standpoint.

5. Phagocytosis in the lymphatic nodes. As soon as the particles reach the inner and efferent sinuses of the lymph nodes, they are englobed by the macrophages; the polymorphonuclear leukocytes apparently take little part.

With typhoid bacilli the same is true except that they are attacked earlier, *i. e.*, in the afferent sinuses.

There seems to be a selective action among the phagocytes as to which, the macro- or the microphages, are to attack the invaders. If staphylococci be injected, the microphages are much more actively engaged than in typhoid bacilli injections, though their chief opponent is still the macrophage.

In four to five hours degeneration in the bacilli (practically all intracellular) is evident.

6. Phagocytosis and bacteriolysis in the organs. After injection of typhoid bacilli, Buxton found that the liver is earliest and most extensively concerned in the localization of the organisms, next to it the spleen and bone marrow. The power of explosive destructions in the peritoneal fluid varies greatly in the different animals, so, too, does the destruction in the organs vary. During the first two or three hours the bacilli decrease very rapidly in numbers. This is probably due more or less to the bactericidal action of the body fluids, and, as this power becomes exhausted, the slower process of phagocytosis continues the defensive measures. The findings are entirely in accord with this statement. During the first two hours

the organisms decrease rapidly, then during the next three or four hours they increase rapidly, probably by both multiplication and arrival of new invaders. From this time on a gradual decrease takes place until all have disappeared. Of course, it is entirely possible that this secondary destruction is due to a recovery of the bactericidal powers of the body fluids. There is experimental support of this. *This has great practical significance*, as it shows that if we can tide the patient over the initial lethal dose, the resistance is so enormously increased that recovery is the rule, even though secondary infections occur as indicated in the analysis of our cases. Bail found that bacteria are less actively destroyed in serum *plus organ cells*, work which Buxton has confirmed. Hoke made experiments with similar results, concluding that the organ cells absorbed the complement, thus depriving the serum of its bacteriological powers.

It may be well to review, in a general way, Buxton and Torrey's work:

1. There is a rapid extracellular *bacteriolysis* in the peritoneum immediately after injection of bacteria. It may be explosive or take place in from one to two hours.

2. After this has expended its force the process of destruction continues more slowly by phagocytosis.

3. There is no reason to believe that the destruction in the organs is more important than that in the peritoneum; in fact, the contrary is probably true.

4. Phagocytosis in the tissues is most active in the anterior mediastinal lymph nodes.

PATHOGENESIS.

We have long recognized three forms of peritonitis—chemical, mechanical, and bacterial. Tavel and Lanz first introduced the term "chemical" peritonitis, applying it to cases in which they failed to find microörganisms (or only the Staphylococcus albus—which they chose to consider a contamination) in the peritoneal exudate, sometimes even in very septic cases. The error may lie

in this, that their cultures were probably made from the fluid only. Recent researches of Gruber and Durham, Buxton, Dudgeon and Sargent, and others have shown that a very short time after injection of organisms into the cavity the fluid may be sterile, while the surface of the omentum, the intestines, and possibly the diaphragm, hold the microörganisms on a thin coating of fibrin, or the organisms may be destroyed "explosively." It seems, then, that clinically the term "chemical" peritonitis is of diminishing importance, and recent enunciations are more and more emphatic on this subject. "The practical outcome of the bacterial origin of peritonitis is shown by the mental attitude which is gradually abolishing the term 'acute peritonitis' in favor of the more rational one of 'acute peritoneal infection' " (Mayo Robson).

Durham, twelve years ago, stated that "pieces of omentum will sometimes show both microscopically and in culture that microbes are present whilst the fluid of the peritoneum is sterile. . . . These facts make one chary of accepting the 'chemical (aseptic)' peritonitis of Tavel and Lanz."

However, we know that the ruptured ovarian cysts, the contents of which are sterile, are capable of producing a peritonitis; the application of foreign chemicals (tr. iodine, turpentine, formalin, croton oil, bacterial toxins) or the escape of body chemicals from a neighboring organ (trypsin, bile, urine) may produce, pathologically at least, a typical peritonitis. It is our opinion that the term "chemical peritonitis" should be retained, if only to apply to the form produced experimentally or therapeuticlly to prepare the peritoneum to resist later infection or exposure to infection, as we frequently prepare the synovia preceding operations on the knee-joint and for the form experimentally produced by nuclein, oils, and aleuronat, to be spoken of later. If the peritoneum be exposed to chemical irritants, the superficial layer of cells, *i. e.*, the endothelium, is destroyed and inflammatory manifestations appear, as hyperemia, proliferation and roughening of the endothelia, diapedesis of leukocytes, and the formation of a serous or fibrinous exudate, occasionally leaving permanent adhesions. This form of peritonitis, as an inflammation, is never fatal, but it seems to us

that the existence of chemical peritonitis is definitely settled. Dudgeon and Sargent look upon all inflammatory reactions as due to an organism, and in such cases as we have described, as due to the white staphylococcus. However, we must have a name for it, and even at that we are not so sure that the injection of nuclein, fat, adrenalin, mercury, turpentine, etc., determines the appearance of staphylococci. In our experiments on the knee-joint we found no organisms. The peritonitis due to hemorrhage (ectopic gestation, etc.) is not an aseptic peritonitis. In every case (save one operated two hours after injury) Dudgeon and Sargent found the white staphylococcus. It is to the action of this organism that the limiting adhesions are due.

The presence of solid particles in the peritoneum is, in itself, not sufficient to produce a peritonitis; the phenomena due to irritation may be present, it is true, but pathologically there are essential differences. The twisting of the pedicle of a tumor, the presence of a sponge irritating the peritoneum, with the consequent reddening and exudation, are the nearest approaches we have to a mechanical peritonitis. These, we believe, prepare the way for bacteria to enter the peritoneum or produce sufficient injury to enable them to gain a foothold after entrance. The association of solid particles with bacteria forms a predisposing element of very great importance, leading sometimes to vicious infections. Kocher described a condition of "implantation infection" in which solid particles are present; in these the degree of sepsis is far greater than otherwise. Spores of tetanus bacilli injected under the skin of animals without injury to the subcutaneous tissues, or the presence of other bodies or irritating suspension media, are destroyed and the animals remain in good health. If, however, foreign bodies be introduced with them, a typical tetanus develops. We found in our experiments that many microörganisms injected into joints without foreign bodies produce no inflammatory reaction, while the same culture injected with foreign bodies produces virulent synovitis. It is for this reason that our Fourth of July injuries are so dangerous—the wadding of the blank cartridges is the counterpart of experimental foreign bodies.

This brings us to the question whether it would not be better to dispense with mechanical irritation in surgery. Are the silk ligatures, and others of non-animal material, factors predisposing to infection? It seems to us, according to the above experimental results, that catgut is the ideal material. It is an animal tissue, easily penetrated by animal secretions and leukocytes, and consequently acts less as a foreign body than some of our other suture materials.

The introdutcion or penetration of bacteria into the peritoneal cavity is not sufficient to produce peritonitis if that membrane be healthy and free from foreign bodies.

We are all well aware today that few, if any, laparotomies are conducted without the introduction of *some* bacteria into the peritoneal cavity, even under the most thorough aseptic precautions. If, however, the peritoneum be previously or concomitantly injured (chemically or mechanically, and certain operative procedures are such), infection readily takes place. This was shown by Walthard, who injected into the peritoneal cavity of rabbits, which had been operated upon to produce a field for the growth by injury in manipulations and drying incident to the operation (a point this writer emphasizes), and produced peritonitis in *every case*, while controls, even when larger doses were injected, failed to produce peritonitis.

Why is this? It would seem that the healthy peritoneum can absorb and destroy certain quantities of bacteria without harm to the host. This is well exemplified in the adhesions one finds about an old healed gastric ulcer, around old appendical inflammations, pus tubes, etc. Indeed, here bacterial escape through diseased tissues has had a decidedly beneficial effect in producing encapsulating adhesions. With overwhelming doses of bacteria from cultures there are also their metabolic products (toxins) which, as already mentioned, excite a chemical peritonitis, destroy the endothelium, giving the bacteria an opportunity to multiply and to become absorbed—and a peritonitis is the result. In some cases the animal dies even before the bacteria find time to multiply, as was shown by Buxton in experiments already cited, in which the bacilli were destroyed explosively, and yet the animal died, probably being overwhelmed by the endotoxins thus liberated.

In peritonitis without perforation of hollow viscera we assume that the peritoneum is in some way injured or rendered susceptible, and that bacteria reach it either by continuity or by migrating from hollow viscera. An example of this is puerperal peritonitis, in which there is in the order given an endometritis, say streptococcic, then a metritis, and finally a perimetritis or localized subperitoneal cellulitis, from which it is only another step to a universal peritonitis by spreading. Subperitoneal infections are more dangerous than peritoneal infections: (1) Because the cellular tissue has more rapid absorption and offers less resistance than the peritoneum; and (2) because the cellular tissue does not permit of drainage until abscess formation. The extension may be along the mucosa of the Fallopian tubes and out into the general peritoneal cavity before these have time to close (by inflammation), examples of infection by continuity and contiguity.

The penetration of bacteria from healthy hollow viscera is an unsettled question. Zagari fed dogs with tubercle bacilli and found that they could penetrate into the circulation without a previous lesion of the intestinal epithelium. Of course, this is always open to serious doubts. Who can say that a given intestine is entirely normal? With deranged epithelium it is quite another matter, however, and experimental and clinical evidence is abundant that bacteria penetrate without perforation, in diarrheas, ulcers with peritonitis before perforation, ulcerative appendicitis, in tuberculous nodules on the serosa of the intestine near a tuberculous ulcer of the intestines, strangulation sacs, etc., etc. Tubercle bacilli are particularly prone to enter the subepithelial lymph spaces without leaving any evidence at the atrium of invasion and without gross pathological changes on the surface, as so frequently observed in tuberculous cervical adenitis. In perforations of hollow organs we have a very different state of affairs, everything essential to the production of virulent peritonitis being there. First, we have the chemical products (intestinal ferments, bile, bacterial toxins, etc.) to produce a chemical peritonitis, and, to make assurance doubly sure, foreign bodies (feces, gallstones, etc.) to produce mechanical injury, and finally the bacteria, which find a field well

prepared for their growth in the chemical and mechanical irritative conditions. Rinné showed that chemical injury is far more potent to reduce peritoneal vitality and predispose it to infection than is mechanical injury.

The violent insult of chemicals from the hollow viscera when such irritating substances as bile, trypsin, intestinal juices, etc., are discharged into the abdominal cavity must not be confused with the mild, almost measurable irritation in the experimental, perhaps soon prophylactic "chemical" peritonitis of nuclein, oils, formalin, etc.

ETIOLOGY.

Hematogenous or cryptogenetic peritonitis is an extremely rare condition, yet we must grant that it may occur occasionally, but it is not of sufficient importance to consider at length in this paper. This form is most common as a metastatic manifestation or a terminal event in Bright's disease, gout, hepatic cirrhosis, or some other chronic debilitating disease. Modern pathological teachings lead us to look upon most of these as errors at the bedside or the autopsy table, some minute perforation or traumatic etiological factor being overlooked.

Perforation. Of the perforative forms of peritonitis we cannot help but give the one which, logically, occurs to us first, namely, penetration from without, gunshot and stab wounds being the types most often presented.

Of the endogenous perforative cases, in which we are most interested, the source of the trouble is by far the most often in the alimentary canal, somewhere from the cardiac end of the stomach to that part of the rectum which severs its connection with the peritoneum; in the alimentary canal we have again two zones of particular danger, viz.: the vermiform appendix and the region of the pylorus. These two zones represent the source of infection in upward of 90 per cent. of our cases of diffuse peritonitis.

In some of the fulminating cases of appendicitis the appendix may rupture or, indeed, slough off entirely before there is any local

protective peritonitis tending to wall it off, or localized abscess may rupture as the result of some slight trauma or more or less active peristalsis.

The perforating ulcerations of the stomach are usually the simple or peptic ulcers, though occasionally carcinomatous ulcers penetrate the stomach wall. Cases are reported not infrequently where the infection in and about the ulcer is so active as to lead to a phlegmonous gastritis with extension to and involvement of the peritoneum without actual perforation. Analogous to this condition is that found in the strangulated herniæ, both internal and external, intussusception, volvulus, and septic embolism of the intestine which produce a partial gangrene or a phlegmonous inflammation of the mucous coat or entire intestinal wall, with migration of microörganisms and a diffuse peritonitis.

Typhoid, dysenteric, tuberculous, syphilitic, and carcinomatous ulcers of the intestine are occasional causes of this condition.

Traumatic rupture of the intestine, whether subcutaneous or penetrating, is a frequent clinical form of perforation. An element of protection to the patient in these cases is the tendency of the muscularis of the healthy intestine to contract about these openings. It is surprising sometimes to find at operation how little fecal matter has escaped in a case with perhaps a complete transverse separation of the gut, several hours having elapsed since injury, which accounts for the good surgical results secured in perforating wounds when the operation has been performed immediately after the accident, as forcefully illustrated by Harris' (as stated by him in discussing this paper) 15 recoveries out of 17 cases operated within six hours after the accident.

Occasionally foreign bodies swallowed (pins, fish-bones, etc.) cause a "perforative" peritonitis. Empyema of the gall-bladder, or, indeed, less virulent cholecystitis with cholelithiasis, may lead to peritonitis either by extension or perforation.

Traumatic rupture of the renal cyst or urinary bladder, even if healthy, is particularly dangerous, as the decomposing urine irritates the peritoneum—infection is only another step. It is in this class that we get the explosive types of absorption.

There occurred in the practice of my colleague, Dr. E. W. Lee, in 1894, a case of large renal cyst filling the left hypochondrium, into which an exploring needle had been inserted; its withdrawal was followed by leakage of the urine into the free peritoneal cavity, causing intense pain, great mental anxiety, and hypersensitiveness of the entire abdomen. The patient was immediately taken to the hospital and operated. There was a large quantity of urinary fluid in the peritoneum, with intense hyperemia of the surface, and some fibrionus exudate. The abdomen was washed out, the renal cyst removed, drainage instituted. The patient died thirteen hours after the exploratory puncture.

Liver abscesses, splenic infarcts, pancreatitis, simple or suppurative, are occasional causes of peritonitis, with or without rupture into the cavity.

In the female we have another most potent source of infection, the internal genitalia. The postabortive and postpartum infections with extension to the subperitoneal cellular structures and the infection from the tubes, either through the open ostia or by extension through their substance, are the most common forms. Occasionally perforation of these organs occurs during labor by rupture of the uterus or the vaults of the vagina, or by instrumental manipulations, either during labor or vaginal operations.

Other rare sources of infection are: breaking down lymphatic glands (typhoid for example), suppurating kidneys, suppurative pylephlebitis, infection of the scrotal or penile tissues, with extension along the vas deferens or through a tunica vaginalis incompletely separated from the peritoneum.

CAUSES OF DEATH IN PERITONITIS.

In the course of Buxton's experiments with typhoid bacilli the rabbits died in two quite well-defined periods, which he believes have their analogies in the human afflicted with peritonitis. The animals died either within the first two hours after injection, or death was deferred to or beyond twenty-four hours. However,

animals surviving the first critical period usually recovered, a point we shall emphasize in discussing treatment.

Examination of the peritoneal fluid and organs of rabbits succumbing early to the inoculation show a strikingly uniform extensive destruction of the bacteria injected. *The reaction on the part of the rabbit was good.* What, then, has been the cause of death? Presumably the liberation of toxins on the death of so many bacteria resulted in an overwhelming dose of bacterial poison, and the animal succumbed. Support is given this by another experiment in which he injected dead bacilli into a vein. Death was early (one-half to one hour), and was clearly due to intoxication, the shorter period being easily explained when one considers that the bacteria were already dead, with the endotoxins perhaps liberated, and that these were injected directly into the bloodvessels.

The animal which died after twenty-four hours usually had innumerable bacilli in its peritoneum and organs; death was apparently due to a peritonitis with septicemia.

In man, Dudgeon and Sargent observed that some died within a few hours and others succumbed in ten to twelve days. This has not been our experience. In peritonitis, traumatic and perforative, the patients succumbed, as a rule, between the thirtieth and fifty-sixth hour of the perforation; surviving this, they lived from six to eight days.

Formerly, many cases dying soon after such an operation were said to have died of "shock." It seems to Buxton, and we fully agree, that these cases died of an overwhelming dose of bacterial toxins, some because absorption was favored, if not actually aided by wiping, irrigating, and excessive handling and sponging of organs. In others the intoxication had already become so great, by delay in operation, that the least manipulation was enough to cause sufficient absorption to produce the fatal effect.

Buxton has made the statement that our dictum, "The primary overwhelming dose of *toxins*," should be paraphrased, "The primary overwhelming dose of *bacteria*."

It seems to us, in the light of the above discussion, that our original statement, "The primary overwhelming dose of *toxins*,"

is not only justified, but strongly fortified by his own conclusions. It is the toxins that are liberated during manipulation that cause so many of our early deaths after operations for appendicitis with general peritonitis, and if previous absorption has not been too great the patient will recover with the same uniformity that our alkaloidal poisoning cases do, if we can but tide them over the acute manifestations.

An important fact corroborating all this is seen in the statistics gathered on streptococcic and colon bacillus peritonitides. The cases of the former die uniformly in twenty-four to forty-eight hours; the latter either in the first few hours or not for several days, leaving a gap with few or no deaths, a period corresponding exactly with the lethal period in streptococcic cases.

What is the explanation? The streptococcus generalizes rapidly, whether aided or not by irrigation; it is not rapidly destroyed, hence liberates few toxins; death, therefore, does not occur until it has proliferated sufficiently to cause intoxication by death of the old organism.

In colon bacillus infections (and this is the organism of greatest importance in appendical peritonitis) if irrigation be practised the bacilli are aided in their rush to the diaphragm and thence to the organs, are rapidly destroyed, and the patient dies of toxemia, with symptoms not unlike "shock," usually reported as "death from shock." But if bacillary absorption be slight (no irrigation, hence limited diffusion), the poisoning is likewise slight, and the patient "reacts to the shock."

Late deaths in the colon bacillus cases are due to a constant increase of bacilli in the peritoneum (general peritonitis) with absorption of the toxins and possibly of the bacteria, death occurring from a cumulative toxemia.

The streptococcus deaths are then due to a sepsis, the colon bacillus cases either to the "primary overwhelming dose of bacteria and toxins," or later to a general peritonitis with a cumulative toxemia.

BACTERIOLOGY.

The recent monograph on the "Bacteriology of Peritonitis," by Dudgeon and Sargent, has thrown the former views on this subject into great confusion. Their work was done exclusively on the living subject (at the *beginning* of operations), and it is this which makes it so valuable. All the statistics of the past, nearly all drawn from postmortem bacteriology, are worse than worthless, for the colon bacillus and other organisms invade the tissues as early as two hours after death, a fact brought out by Tavel and Lanz in their monograph in 1893.

Great importance is attached to the Staphylococcus albus, an organism formerly looked upon as a more or less harmless yet ubiquitous invader of all pus infections, especially stitch abscesses, and was found even in aseptic wounds, where it was presumed an aid to healing. The organism is non-pathogenic, or at most of extremely low virulence.

The work of Dudgeon and Sargent establishes for this microorganism a most important role in the pathogenesis of peritonitis. It appears early at the site of trouble, its function being to determine a rush of fluid and leukocytes, which do not degenerate in its presence, as they do in that of the colon bacillus, for example. Its origin is technically unknown, but there can be no doubt that it comes from the intestine.

This protective function has been proved experimentally as follows: Peritoneal injections of Staphylococcus albus and colon bacillus cultures in mixture result in peritonitis; but if the Staphylococcus albus injection precede that of the colon bacillus by three hours, peritonitis does not occur. Protection against infection is attributable to the phagocytosis excited by the white staphylococcus (after the initial leukopenia is over), resulting in a local immunity against infection.

It acts not only by promoting a local immunity, but it causes sufficient reaction (in itself harmless to the host) to produce agglutinations and adhesions, which tend to limit infection. This state-

ment is not a mere hypothesis; the organism has been found alone in these early fibrinous exudates. In cases of pelvic hematocele, this organism was present in every case without exception. Dudgeon and Sargent believe that this organism determined the adhesions walling off the hematocele.

It *appears first* and *disappears last* in all abdominal infections of intestinal origin. After the subsidence of an acute attack of appendicitis the Staphylococcus albus is present for a long period of time, presumably keeping up a low grade of protective inflammation.

It seems to us that the infiltration of the subperitoneal tissues, with its lymphatic coffer-damming, is another essential element in the immunity produced by the white staphylococcus, not sufficiently emphasized by Dudgeon and Sargent.

From the presence or absence of staphylococci they draw the following conclusions: "If phagocytes and staphylococci are abundant, in a region remote from the focus of infection, the prognosis is good; if bacilli are present with staphylococci and phagocytes, the prognosis is grave, but not hopeless; if there are a few phagocytes, few staphylococci, and many bacilli or streptococci, the prognosis is grave."

While the organism produced slight illness in experimental animals for a few hours after injection, this may be looked upon as due to the exudate thrown out, for none of the animals died. It is possible that the invasion of hematomata by this organism in the human is a cause of the so-called "fermentation fever."

Most peritonitides are mixed infections; especially is this true of the cases which prove fatal. Predöhl found 10 mixed infections in 14 examined; Krogius found 35 mixed, 3 simple, and 2 sterile (?) in 40 cases. Fraenkel, on the other hand, found 20 simple infections in 31 cases. It must be borne in mind that these statistics depend somewhat upon the methods used in determining the organisms present. Smears are the most accurate, since in culture the organism may overgrow or subdue the rest (*i. e.*, colon bacillus), and statistical inconsistencies result.

The colon bacillus, the streptococcus, the pneumococcus, B. pyocyaneus, the typhoid bacillus, the gonococcus, and the Staphy-

lococcus pyogenes aureus are the most important, in the order given. Other more or less saprophytic organisms occur: Diplococcus intestinalis major and minor, coccus conglomeratus, B. pyogenes fetidus, proteus vulgaris, and others (Tavel and Lanz). Bacillus tuberculosis, tetani and mallei, the rays of actinomycosis, and anaërobic organisms are occasionally found.

The colon bacillus is, undoubtedly, the most important. Larnelle and Malvoz considered peritoneal infections of intestinal origin as due almost exclusively to this organism, a view not in accord with the facts. Many of the cases cited by them were doubtless in the beginning mixed infections, the associated organisms being later overgrown by the colon bacillus. This property of the organism is well exemplified by the case of Charrin and Veillon. In an autopsy performed three hours after death, the pneumococcus alone was found in the exudate. Twenty-four hours later, however, the colon bacillus was found *alone*, the less hardy pneumococcus being entirely supplanted by the proliferation of a postmortem invader; the case was one of terminal peritonitis with cirrhosis of the liver. In Krogius' series the colon bacillus was present in 35 of 38 cases.

Its virulence depends to some extent upon the location of the perforation, the condition of the bowel, and the pathologic changes responsible for the peritonitis. Klencki's experiments show that the colon bacillus is least virulent in the jejunum, most so in the ileum, and intermediately so in the colon; hence the colon bacillus in the ileocecal and appendical region is from the intermediate to the most severe virulence. Corner states that bacterial activity is at its maximum in the region of the cecum. Its virulence is increased greatly in diarrheas, and in the lumen of a strangulated gut. We believe that its virulence is greatly increased by its development under pressure. It is to be remembered that the colon bacillus is present in every perforative peritonitis, not as one well-defined organism, but represented by several strains, usually of varying virulence and even morphology and cultural characteristics.

"In peritonitis we consider that certain bacilli of the colon group are the most important, the most common, and not infrequently

the most virulent of the organisms which are known to cause peritonitis" (Dudgeon and Sargent).

The colon bacillus may remain in a quiescent appendix long after the attack, and because of the retention show a tendency to become virulent. Hence such an appendix may lead to a fatal peritonitis if precautions against infection are not taken.

The Streptococcus pyogenes variety of peritonitis is an extremely fatal though not necessarily hopeless one. In appendical perforations it is fortunately not so very often present. A. O. J. Kelly found it once only in 94 cases, Krogius once in 40 cases, Low and Lartigan, on the other hand, found it in 81 per cent. and 75 per cent., respectively, of cases of acute appendicitis (three and four days in duration). E. M. Corner and Harvey Cushing state that the streptococcus is a widely distributed organism, but is usually lost in artificial culture, and that it is a much more common cause than supposed. The great diversity of percentages of bacterial findings are, we believe, attributable to the fact that many observers make their cultures and smear from the fluid in the peritoneal cavity, while others take them from the surface of the organs and peritoneum. These two methods would give entirely different findings. Dudgeon and Sargent failed to find the streptococcus in a single instance of non-perforative diffuse peritonitis due to appendicitis, and we found it only once in pure culture, this case having the greatest leukocyte reaction (80,000) in our entire series. The gynecologist frequently encounters it in postpartum infections, when its virulence seems to be especially great, probably because it is then a subperitoneal cellulitis, a condition peritoneal drainage does not benefit, as it is analagous to a hypodermic injection into the cellular tissues of the pelvis. Its tendency to spread rapidly to septicemia has already been mentioned.

Pneumococcic peritonitis is rather rare, especially in adults, and even more so in the male, but cases are being reported with increasing frequency. It is rather common in female children, where it gains entrance through the Fallopian tubes; it is then often limited entirely to the pelvic peritoneum. In 33 cases of pneumococcal peritonitis collected by Quèhart, 27 were in girls and 6 in

boys. Dieulafoy states that the invasion in pneumococcal peritonitis is characteristically sudden. We found it in one of our patients (case cited later).

Ghon reports several cases of this etiology, three following perforation of the stomach in ulcer or carcinoma, and a fourth occurring in a patient with carcinoma of the stomach without perforation; one of the cases had a coincident pneumonia. He stated that Jensen isolated the pneumococcus in 3 cases following perforative gastric ulcer and that Brunner collected 22 cases of perforations of gastric ulcers in which bacteriological examinations had been made, 4 showing the pneumococcus. This is probably due to the fact that the saliva, which so frequently contains pneumococci, is swallowed; the organisms then pass through the perforation before the gastric juice has had time to destroy them.

Cases are commonly reported of pneumococcal peritonitis, hematogenous in origin, secondary to pneumonia.

The organism has been found in the exudate of peritonitis due to appendicitis by Veillon and Zuber. It was isolated once by Dudgeon and Sargent from an appendical abscess; they do not look upon it as an important organism in appendical peritonitis, however.

Fraser and Bowen report a series of 16 cases in children, and conclude that it is a rather rare disease and that it is secondary to some other pneumococcal lesion in one-third of the cases. In the other two-thirds it is probably infected from the bowel. It is a very fatal form of peritonitis.

Ashdowné reports a case of primary pneumococcal peritonitis in a woman. The abdomen was opened and no perforative lesion found; it was flushed and drained. Death followed in a few hours. He has collected 31 cases from the literature, some cited above. It is associated with diarrhea, great mental excitement, and an odorless pus.

Cases of this etiology are being reported with increasing frequency, since the laboratory work is carried out more carefully.

The bacillus of blue pus (Bacillus pyocyaneus), while not a commcommon cause of peritonitis, becomes important because of its

variable, often great, pathogenicity. It was formerly considered non-pathogenic, and as it is a normal inhabitant of the intestine, under favorable circumstances it may become a cause of peritonitis; it is usually very virulent, being second only to the streptococcus. Green or blue pus is never produced in the peritoneal cavity, as access to free air is essential to the formation of the pigment pyocyanin. It is a curious fact that this organism is never found in mixed infection with the colon bacillus. An experimental symbiosis is also difficult of attainment.

Gonorrheal peritonitis is a type the existence of which has been contested by many pathologists; there are, however, numerous clinical cases reported. Wertheim (quoted by Cushing—see below) showed by culture and inoculation that gonococci can produce a localized peritonitis. Cushing published two cases in which he found the gonococcus *alone*. Hugh Young has also reported cases. Charles Goodman recently reported a case, and gives the literature of the subject.

It may be true that the pure culture type in the female is of mild virulence, but the clinical fact remains that a peritonitis metastatic from a gonorrhea may be extremely virulent. In November, 1880, the author observed his first case of that character in the male in an ordinary gonorrhea of the third week. The patient had a mild chill, the following day had effusion in both knee-joints, forty-eight hours later intense pain in the abdomen and great effusion, and the following morning effusion in both pleuræ, forty-eight hours later cerebrospinal meningitis, pericarditis, and finally, coma and death. The amount of pus in the abdomen was very great, not offensive, and resembled that in the joints and pleuræ.

The Staphylococcus pyogenes aureus as a cause of peritonitis clinically is rare. It occurs most often in penetrating wounds of the abdomen and as an accident in experimental work or after operation where the technique has been faulty. Flexner's statistics bear out these statements. Dudgeon and Sargent are not convinced that the Staphylococcus pyogenes aureus is so very rare in peritonitis. They look upon the group of staphylococci much as they do upon the colon group, with variations from one end of the line

of pathogenetic properties to the other of the non-pathogenic albus variety.

Veillon and Zuber supposed that they had sufficient evidence to show that anaërobic organisms are important causes of appendicitis.

Tavel and Lanz, in their more recent work, arrived at similar conclusions. The organisms were frequently found in the pus of abscesses and in the peritoneal cavity in peritonitis. They believed that the gangrene and offensive odor were due to these organisms.

Dudgeon and Sargent do not give anaërobes as important a place, finding a representative only once, the B. aërogenes capsulatus (B. perfringens of Veillon and Zuber, and "one of the B. of malignant edema" of Tavel and Lanz). In our experience anaërobes, and especially aërogenous varieties, have been very rare.

In typhoid perforations the peritonitis is not often due to the typhoid bacillus, as one might expect, but most often to the colon varieties, occasionally streptococci, etc., therefore, in dealing with typhoid perforative peritonitis we are dealing essentially with colon bacillus peritonitis without additional virulent microörganisms, as we formerly believed, and to which we attributed the almost uniformly fatal result.

Peritonitis is dangerous directly in proportion to the absorption. It is not the inflammation of the peritoneum that is fatal, but the toxins which are absorbed from its products that cause the severe manifestations or perhaps death.

The question arises, Does an inflammation accelerate or retard absorption from this cavity? The latter was believed by many to be a prerequisite to the production of peritonitis. Much experimental work and writing has been done on this subject, but with inconclusive, yes, often contradictory, results.

Schnitzler and Ewald, after numerous experiments, in which potassium iodide and potassium ferrocyanide were injected into the peritoneum in both the absence and presence of experimental peritonitis, concluded, on timing the *appearance* of the chemical in the urine, that absorption is slowed in the presence of infection.

Chronic irritations (the long carrying of glass marbles) had a similar result.

Clairmont and Haberer took exceptions to some of their conclusions, and undertook the same work with diametrically opposite conclusions, drawn from the time of *final disappearance* of the chemical from the urine.

Finally, the most recent and exhaustive work on the subject is that of Glimm. His work was entirely quantitative, using lactose as the injected material and estimating the time of quantitative excretion in the urine of the material injected. Peritonitis was induced by an especially virulent strain of colon bacillus, and always on animals in which the normal absorption time had been estimated about three hours previously for control. His conclusion agrees, in the main, with that of Clairmont and Haberer, viz.: that absorption is accelerated in peritonitis.

There can be no doubt of the accuracy of his deductions so far as his work is concerned, but the great error in his work is that *all* of his experiments were carried out within the first fourteen hours of peritonitis. *But what is the state of affairs later, in advanced peritonitis?* Clairmont and Haberer, it is true, concluded from one or two experiments, in which the animal died rather quickly, that in "advanced peritonitis absorption is slowed," a statement contradicted by Glimm.

What is the clinical experience in this matter? As early as 1896, at the meeting of the American Associations of Obstetricians and Gynecologists, we stated that there is *an early acceleration*, with a *later slowing of absorption* in peritonitis. J. C. Munro agrees with us in this statement. If we can but tide our patients over this period of acceleration of absorption all will be well. The peritoneum resembles all other structures in the body in these particulars; immediately after abrasions, lacerations, and excoriations absorption is rapid and at its maximum; as time passes and the lymph spaces become coffer-dammed and filled with leukocytes, and later cell proliferation and edema block the spaces, absorption becomes less and less until it is practically *nil*, as recognized in the walls of old abscesses, floors of granulating wounds, etc. Every old inflam-

matory base offers great resistance to infection. Therefore, time is an important element in the development of local immunity.

The experimental laboratory has its limitations, in the greater difficulty of drawing conclusions from results on animals, in the limited number of experiments, always under artificial conditions, and in the impossibility to isolate the peritoneal sac and then study afferent blood and lymphatic vessels to determine absorption time.

In drawing his conclusions, Glimm overlooked the fact that he studied no advanced case of peritonitis (fourteen hours after injection of the colon bacillus being the latest). And further, in drawing conclusions from urinary excretion of the substance injected, the influence of febrile oliguria, splanchnic hyperemia, with concomitant lowered blood pressure, as well as other modifying conditions, were of necessity disregarded. One of his experiments (in the animal that died in five and one-half hours) (No. 24), with no sugar in the peritoneal cavity, and only 1.7235 grams (of 2.4 injected) excreted in the urine, in a period of time in which the same animal when healthy had excreted 1.965 grams, substantiates this statement. If we consider that the peritonitis was *advanced* because the animal died, our stand that absorption is delayed in advanced cases is fortified. The fact that there was no lactose in the peritoneum in no way alters the case, since we do not know when the peritoneum was free from sugar in the animals which survived. Lactose being soluble in water, it is granted that such a substance is absorbed into the blood in a large measure. Whether bacterial absorption (an element of considerable individual importance), which is manifestly by way of the lymph chiefly, is affected similarly remains to be proved. As a matter of fact, researches yet to be spoken of tend to show that "reactions" (inflammation) slow bacterial absorption from the first.

Another error in experimental work of this kind is that all the work so far has been done with an *exhaustible* supply of substance in the peritoneum. In peritonitis the supply is for the time being *not only inexhaustible*, but constantly being *augmented*. If we could but find a way to measure pus absorption in these animals, or, so long as this is so difficult of accomplishment, could find some way

of keeping the quantity of experimental indicator constant in the peritoneal cavity, another story might be told when the experimenter draws his conclusions.

Is this increase of absorption beneficial to the patient? If our statement that peritonitis is dangerous in proportion to the absorption be true, it must be detrimental, at least from the standpoint of intoxication. Does it lessen the process locally, *i. e.*, does it exert a beneficial effect by carrying away bacteria and toxins, lessening the local process and giving the entire bodily forces the opportunity to take part in the defence? It seems to us that Peiser has most aptly discussed the question and arrived at conclusions that are logical. As we have seen, the toxins are absorbed chiefly by the blood, and the bacteria *soon reach* the blood by way of the lymphatics. The phagocytes and alexins are then compelled to do battle *in the blood*, and each unit vanquished in this skirmish is a unit less to oppose the bacteria and toxins in the battle-royal in the peritoneum. The conclusion, it is true, is largely theoretical, yet its truth can scarcely be called into question.

With this, too, vanishes the old idea that a slowing of absorption is necessary for the production of peritonitis.

It may be well to mention here the work that has been done recently in increasing peritoneal resistance to infection by injection of various substances into the peritoneal cavity.

Issaeff is, perhaps, the first investigator along this line; he noted the efficiency of normal salt solution and nucleic acid injections as early as 1894.

Exner was the next to do work of value. He found that intraperitoneal injections of adrenalin, nine to forty-five minutes before introducing poisons (strychnine, physostigmine, potassium cyanide), protected the animal against doses of these poisons which were uniformly fatal in control animals. His work has been severely criticised by Wells and Mendel and Meltzer and Auer, because of various inaccuracies, but it seems to us that the protection afforded animals against alkaloids and potassium cyanide are prima facie evidence of a protective influence of adrenalin injections, be their technical and quantitative errors what they may.

In 1904 Klapp presented to the *Chirurgische Kongress* the fact that mucoid material and fats injected into the peritoneal cavity slow absorption, presumably by blocking the lymphatics.

From this time on the literature is replete with articles on this subject. Mikulicz found that injections of aleuronat and nucleic acid were more efficient than bouillon and salt solutions, and, further, that nucleic acid is more efficient in producing a leukocytosis, both local and general, than aleuronat. There is, at first, a leukopenia, perhaps analagous to the initial leukopenia of Buxton described under his typhoid experiments, followed in several hours by a hyperleukocytosis. This was sufficient to protect guinea-pigs against sixteen to twenty times the minimum lethal dose of colon bacilli. Mikulicz was still working on this problem just before his untimely death.

Borchardt confirmed Issaeff's work with similar experiments, and, in the main, agreed with Mikulicz. He found that resistance was greatest forty-eight hours after the injection, disappearing gradually in about three days ("resistance period").

Diez and Compara found that 1 c.c. of a 5 per cent. solution of nucleic acid introduced twenty-hours before injection protected guinea-pigs against twelve times the fatal dose of colon bacilli; it afforded some protection when given only three to four hours before the bacteria.

Glimm has recently used olive oil, lanolin, etc., to protect the peritoneum. His calculations were made by plating blood taken from the carotid artery at varying intervals after intraperitoneal injections of bacteria. He found that the protection afforded was enormous—rarely did his "protected" animal die except as a result of mishap. After proving experimentally that his oils had no inhibitory effect upon the growth of colon bacilli *in vitro*, he concludes that the absorption is hindered probably by mechanical occlusion of the lymphatics (doubtless assuming the presence of the stomata). Inasmuch as he found olive oil more protective than a colon serum, his work is of very great clinical significance. He states that he "would not hesitate" to inject several cubic centimeters of camphorated oil into the peritoneal cavity of a profoundly toxic case of peritonitis.

Buxton and Tracy have repeated many of these experiments, especially those with nucleic acid and olive oil. In the former they used 3 c.c. of a 5 per cent. solution of nuclein. They noted at first a fall in temperature and leukocytes, then a gradual recovery of the body temperature and a leukocytosis (slower than in Mikulicz's experience). The postmortem showed marked peritoneal "reaction;" the omentum was thickened and congested, the leukocytes were present in large numbers, chiefly the polymorphonuclears; macrophages were also present.

In animals protected by this injection there was approximately only the 1 to 100 invasion of the organs by the colon bacilli as compared with unprotected animals. Undoubtedly, many bacilli were taken up at once by the many leukocytes, preventing invasion. Curiously enough, the omentum did not seem to be as efficient a policeman in its swollen state as did the omentum of the unprotected animal. The anterior mediastinal glands (the route by which bacteria reach the blood) were swollen and congested, but bacilli were very scarce. It is probable, therefore, that nuclein protects by the local "reaction," *i. e.*, inflammation, possibly the subperitoneal infiltration occludes or coffer-dams the lymphatics, as we demonstrated in the injection of a 2 per cent. solution of formalin and glycerin into joints.

They repeated Glimm's fat experiments by using olive oil stained with Soudan III. The result, *i. e.*, diminution of absorption, is the same as that of Glimm, but they found red fat droplets in the lymphatics of the diaphragm and anterior mediastinum, few, it is true, and conclude, therefore, that fat acts the same as nuclein by producing a "reaction."

Of course, all this work is new and comparatively untried. It gives us food for thought, and it is possible we will soon have added a valuable method of guarding against peritoneal infections by prophylactic injections before opening an abscess or opening infective hollow viscera. As a means of treatment we must look upon it *sub judice.*

Willis G. MacDonald presented to the State Medical Society of New York experiments showing that subcutaneous injections of

sodium nucleinate caused an artificial leukocytosis. He has actually made use of this to protect aganist infection in street wounds, etc., where inoculation is certain, with what he believes decided value. In a little girl in whom a volvulus had ruptured it seemed to him to have been a life-saving measure. Vaughan applied this treatment first in the human being, making subcutaneous injections of nuclein in cases of tuberculosis "with beneficial effect."

In all this we have added experimental evidence, though not conducted for that purpose, that early absorptive increase is not beneficial but detrimental to the life of the experimental animal, a conclusion we feel is amply sustained by clinical experience. The above may be cited as evidence in rebuttal of Lennander's statement that the danger in peritonitis is greater if absorption of bacteria be lessened.

PATHOLOGY.

As expressing the extent of the process, the terms now in use are very much at variance. An infection in the peritoneal cavity limited by adhesions, be they ever so delicate, is a circumscribed abscess or peritonitis, depending upon the presence or absence of pus. An appendical abscess may extend to the diaphragm above and to the sigmoid on the left, filling over one-half the entire abdominal cavity, and yet not be considered a diffuse peritonitis because it is circumscribed by adhesions, as illustrated in the author's cuts in Keen's *Surgery*. Where there are no adhesions of any kind, the peritonitis is of a *spreading* nature, a term expressive of its tendencies, and does not carry with it any idea of extent of involvement. *Free* peritonitis is simply another way of stating that the condition is not a localized abscess or circumscribed peritonitis; this also fails to convey any idea of extent of involvement. The terms *diffuse* and *general* have given rise to considerable discussion as to their exact contradistinction. Some writers consider the terms of identical meaning as regards extent of inflammation of the peritoneum, others look upon *spreading* and *diffuse* as synonyms, reserving the word *general* for those rare cases in which the entire peritoneal surface has become involved.

Inasmuch as an involvement of the *entire* peritoneum could be determined only at necropsy, such discussions are academic. It must be admitted that the impression as to extent of involvement gained at the operation may be erroneous. The absence of limiting adhesions, however, can be determined with great accuracy on the operating table, and it is this that justifies, clinically at least (in distinction to a postmortem term), the application, either diffuse or general, to extensive free or spreading peritonitis. Therefore, the term *free peritonitis* should be used for the general diffuse variety and *circumscribed* for the encapsulated form, regardless of the size. Statements have been made to the effect that cases never live until the process becomes general, or that it is a physiological impossibility for a case of general suppurative peritonitis to recover—all of which goes to show that the term has been misunderstood. We do not believe that the term was ever intended to mean (clinically) that every square millimeter of membrane was involved.

According to the condition of the peritoneum and the nature of the exudate, peritonitides are described pathologically as diffuse septic and diffuse suppurative, and to each of these others qualifying terms designating some particular pathological change may be added, *e. g.*, putrid, serous, fibrinous fibrinoplastic, gangrenous, etc.

Diffuse septic peritonitis is the pathological variety usually due to the streptococcus. It seems that this organism in its growth in the peritoneum is characterized by (*a*) a tendency to produce relatively large quantities of toxins and (*b*) very little plastic exudate, and (*c*) by a tendency to penetrate the subserous lymph spaces. The serous element is usually very small.

In cases of puerperal origin, the process is primarily a *subperitoneal cellulitis*, the peritoneum loses its lustre, is much thickened and edematous, occasionally it may show on its surface ineffectual attempts at plastic formations of fibrin shreds, petechiæ, or considerable bloody extravasations may occur as a result of inflammatory injury to vessel walls. It is the *subperitoneal* character of the process that makes this form of peritonitis so fatal. The peritoneum has enormous defensive powers, and, when aided by incision,

recovery is the rule. In this form, however, the peritoneum has exactly the opposite effect, confining the inflammation to a tissue of low vitality and great absorbability and preventing drainage of any kind when incision of the peritoneum is practised.

Where the streptococcus is the cause of a perforative peritonitis, the process resembles more closely that of other organisms. The relative failure of plastic processes is still evident, the peritoneum is dull or even rough, the capillaries dilated, often sufficient to decidedly redden the membrane.

The streptococci readily and rapidly pass through the lymph spaces and vessels into the general circulation—a long-established clinical fact. This rarely occurs with other pathogenic organisms, again emphasizing the danger of absorption and showing its gravity in prognosis. This point has been discussed previously.

Sometimes a distinct fibrinonecrotic membrane is formed similar to the diphtheritic exudate which is "shed" later; the subperitoneal lymphatics and bloodvessels are then exposed to absorption of large quantities of toxins, death ensuing an hour or two after this incident. This absorption resembles the acute intoxications of diphtheria following the exfoliation of the original membrane.

In the less severe processes the exudate may be of the serous or serofibrinous character. This last form of streptococcus infection we believe to be amenable to quite uniformly successful operative treatment. It is at this point that we wish to take exception to Dudgeon and Sargent's statement regarding treatment, that "it is doubtful whether any surgical procedure offers a prospect of success (in streptococcic cases), but if there is any chance, it must lie in the *most thorough possible washing.*" They have doubtless condemned every case of streptococcus infection without due regard to the pathology of the case. It would seem to us that there are three distinct pictures: (1) The puerperal type—peritoneal washing is utterly worthless; (2) the membranous type—washing might be useful could it be done *at the moment of desquamation;* (3) the perforative peritonitis due to the streptococcus—washing is no more justifiable in this than in a colon bacillus infection.

It is to be borne in mind that septic peritonitis, under special

conditions of virulence or lowered resistance, is caused by other organisms than the streptococcus.

In the *suppurative variety* the early loss of peritoneal lustre and capillary dilatation is the same as in the septic type, the cloudiness progresses to a greater extent perhaps, migration of leukocytes in varying degree and serous exudation occur, and a *purulent exudate* is formed in quantities varying from a dram to many pints. The primary effusion we consider defensive in that it contains an army of phagocytes and dilutes and prevents absorption. It must, however, be removed by drainage, or secondary toxic absorption will take place.

In opening the abdomen in a case of suppurative peritonitis the deeper layers of fat are often found edematous, and the thickened injected peritoneum is evident before the cavity is opened. Free gas may be present.

The intestines are distended with gas and fluid, a condition not well understood. It is probable that this is due largely to the injury of the nerves by the subperitoneal infiltration resulting in a paralytic relaxation of the muscle coats and a paralytic intestinal secretion analagous to the paralytic salivary secretions after nerve division.

This distention often leads to trouble for the operator who eviscerates, in that the distention is progressive, and at the end of the operation he finds that he cannot replace the bowel, necessitating the dangerous procedure of incising the intestine to permit the escape of gas, and when the intestines are replaced they are under such great tension that gravity drainage of the cavity is impossible —another contra-indication to evisceration and flushing.

Lennander has found changes in the ganglion cells of Auerbach's plexus in cases of acute peritonitis with much distention.

When distention is prolonged, gangrene of the intestine may take place. The stasis produced by the paresis favors absorption of enterogenous toxins, adding materially to the septic symptoms as in prolonged mechanic ileus.

In patients who resist the toxemia for twenty-four to thirty-six hours, or in whom the infection is relatively mild (probably also a

matter of resistance), the subperitoneal tissues become infiltrated, much like those about a felon, for example; the lymphatics become occluded, and the perivascular spaces are filled with leuko- and lymphocytes, absorption is slowed, the general peritonitis is a *large circumscribed abscess*, if the term may be permitted, because of the infiltrated coffer-dammed wall, and incision is all that is necessary for recovery.

Where the process is most active and the destruction of endothelium greatest, analogous to a third degree burn of the skin, the tendency to adhesions is greatest; these are often permanent. Adhesions, the result of organization of fibrinous exudate, disappear when the exciting cause has ceased to act; on opening the abdomen in the course of six weeks, one is surprised to find they have disappeared and the endothelium smooth throughout the cavity.

SYMPTOMS.

In perforative cases the first symptom is *pain*, which *comes on suddenly*, is intense and paroxysmal in character, at first localized, low down in the abdomen in intestinal perforation, high up or even in the back in gastric perforation; shortly it becomes generalized. It may be so severe that collapse is imminent. Chilly sensations or an actual rigor are not uncommon.

Primary reflex nausea and occasional emesis immediately follow the pain of perforation.

Tenderness is marked, at first localized at the seat of perforation, but as the inflammation advances, becomes general. The abdominal muscles become rigidly contracted, with absolutely no respiratory movement; exceptionally this muscular defence is wanting, possibly an indication of mild infection.

The pulse is rapid, small, and has a peculiar *hard*, *wiry* character in the early stages. As the toxemia increases the pulse becomes softer, irregular, and finally fails entirely. The pulse is a more reliable guide as to the patient's general condition than the temperature.

The position assumed by the patient is quite characteristic, the thighs are drawn up, and, if possible, the shoulders elevated; the respiration becomes very superficial and *costal* in type.

The temperature, at first, falls; this is of short duration; it is associated with blanched lips and a cold sweat or dampness of the skin, especially of the forehead and chest. It soon rises, however, and may reach 104° or 105° in septic cases. This may, however, subside to normal or subnormal. It need scarcely be repeated here that the temperature is of little prognostic or even diagnostic value, except that there is always elevation at some time in the course, usually early.

Nausea is an early and important diagnostic symptom, occurring shortly after the onset of pain; it disappears to return later, associated with distressing vomiting, finally only a gulp occurring every few minutes. At first the contents of the stomach are ejected; then, a yellowish green, very bitter fluid is expelled, followed finally by a brownish black liquid with a slight fecal odor. It is probable that a certain amount of the toxins absorbed are thrown into the gastro-intestinal canal, and that the vomiting is an effort of Nature to eliminate them. In these cases gastric lavage should be practised for the comfort of the patient, for the vomiting is extremely distressing; the gastric lavage is a therapeutic measure against the intoxication. Early diarrhea occurs and may be interpreted in the same manner. The tongue becomes dry coated and tremulous, the teeth covered with sordes.

The abdomen gradually becomes distended, tense and tympanitic, without borborygmus, often entirely obliterating the anterior liver dulness, due in such cases to escape of gas which lifts the abdominal wall from the liver.

The picture is characteristic in the fully developed cases, the posture, the rapid, *hard* pulse, the facies, drawn, anxious expression, with sunken eyes, sharply defined nose, hollow temples, and cold, parched, lead-colored skin, with incessant nausea and vomiting, are simulated by nothing else. The peritoneal effusion may occur, but is rarely demonstrated, except by piano percussion.

The patient becomes exhausted, and as the toxemia becomes

greater the heart fails, the vasomotor centre is paralyzed, the pulse becomes weak and more rapid, the breathing shallow, and the capillary cyanosis marked, death occurring in from two to five days, or even earlier in profoundly septic cases. The urine is scanty, dark colored, and contains albumin and indican, either febrile or due to a toxic nephritis.

In typhoid fever, when the patient is in the apathetic state, the onset may not be observed unless the pulse and abdomen be closely watched.

The acuteness of the symptoms depends somewhat upon the location of the infection. Lennander has shown that an infection of the peritoneum in the central zone of the cavity may spread extensively over the small intestine without pain (this is especially true if limited to the visceral peritoneum.)

In the streptococcic cases a general hypersensitiveness, with exaggerated reflexes and active delirium, suggest, by their toxins, a stimulating action upon the cerebrum.

DIAGNOSIS.

The typical case, with pain at the onset, nausea, tenderness, fever, Hippocratic facies, abdominal rigidity, vomiting, and symptoms of collapse should be readily recognized, as the symptoms occur practically in this order; collapse is always a very late symptom, never an initial one.

The history of previous abdominal or digestive disorders is in these cases of the greatest value, often giving a clew to the origin or cause of the perforation, as in gastric or duodenal ulcers a perforation never occurs without antecedent digestive disturbances.

The clinical picture of appendicitis may have preceded the onset of perforative manifestations for hours or days; such cases are seldom mistaken. The errors of management in appendicitis are made especially when a procrastinating course is being followed; when the pain ceases, the temperature suddenly drops to 99° or such a matter, and the entire appearance of the patient is better.

This is often erroneously interpreted as a sign of subsidence of the inflammation, and a hopeful if not absolutely good prognosis is made. To the man of experience such a picture is alarming, suggesting a cessation of absorption, either from a complete gangrene of the appendix, a perforation, or the discharge of the pus into the intestine—at the moment of the occurence we are unable to positively differentiate. In a few hours the patient complains anew of severe pain and nausea, later vomiting, and the abdomen becomes rigid and sensitive.

Another difficult and dangerous condition is the appendical abscess which the surgeon has left "until tomorrow," for his greater convenience. The patient becomes restless during the night, and is awakened by a sudden, severe pain in the abdomen, the symptoms growing progressively worse, accompanied by nausea and vomiting. The mass in the right iliac fossa has disappeared, abdominal rigidity is established—the patient has a general peritonitis.

Preceding gastric symptoms must at all times be inquired into. We believe that in practically no case of perforating gastric ulcer has the patient been entirely free from gastric disturbance of some kind. Usually the picture has been classic. In duodenal perforation there is occasionally a history of gastric distress or pain two to four hours after meals, which could uniformly be relieved by a fresh ingestion of food. The attack begins with a sudden, severe pain in the right side, accompanied by nausea and vomiting. The tenderness extends from the costal arch to the pelvis; the temperature goes up, as well as the leukocytosis. The whole picture is quite like that of acute appendicitis; indeed, that is the most common pre-operative diagnosis, as it was in one of my cases in which Drs. Roswell Park and A. D. Bevan were present. In Moynihan's collection of 51 cases, 19 were operated on the diagnosis of acute appendicitis, and in only 2, one of them his own, was a correct pre-operative diagnosis made.

In general, the early diagnosis of peritonitis is based on the symptoms: pain, nausea and vomiting, localized tenderness, circumscribed flatness *on piano percussion*, abdominal rigidity, elevation of temperature, leukocytosis, and absence of borborygmus.

In women the gynecic history must be carefully elicited, bearing in mind that an ectopic pregnancy or rupture may closely resemble an infectious process. The menstrual history, preceding pregnancies or abortions, vaginal discharge, and the presence of urethral or other evidence of gonorrheal infection must be considered.

In typhoid fever differential diagnosis is often difficult in the extreme. The patient is dull and apathetic; the sensorium is benumbed; he may not express pain; tympanites, which perhaps has actually determined the perforation, is already present, and *unless the pulse and abdomen be closely watched* a perforation may be overlooked, and the patient's only chance of life be lost. The early fall in temperature, the rigid abdomen, the nausea or vomiting, and the rapid pulse with a tendency to sweat are then the only evidences. Leukocytosis may fail in the general tendency toward leukopenia, as was frequently observed in the recent epidemic at Cook County Hospital, Chicago. When it does occur it is of great value. It is well to be on the alert for perforative symptoms after the tenth day of the fever and well into convalescence.

In the less toxic cases, where the patient's mentality is brighter, the sudden, severe pain, followed immediately by nausea, is present in the large majority of cases. Tenderness, beyond that ordinarily present, and vomiting are quite frequent. Rigidity is not so pronounced early in typhoid perforation. It must be borne in mind that a peritonitis can occur without perforation. We have operated on two severe peritonitis cases of this class; both recovered under this treatment; they are not, however, included in this series, since they were not perforative. In typhoid perforation the peritonitis is produced by the colon bacilli rather than by the typhoid bacilli, and should give the same results as are obtained in appendicitis with colon bacillus infection of the peritoneum.

The diagnosis of peritonitis of hematogenous origin, or other than gastro-intestinal or appendical perforation, depends upon careful analysis of preceding symptoms and the examination of the patient. The possibilities are too great for the scope of this paper.

A means of diagnosis, and possibly of prognosis, too often neglected, is leukocytosis—*especially* the *differential* count; in a general

suppurative peritonitis the leukocyte count is more often over 15,000 than below. A differential count, however, is of even greater value. "The increase in the relative number of polynuclear cells is an indication of the virulence of the intoxication, and the degree of leukocytosis is an evidence of the body resistance toward the infection. . . . Purulent infections were rarely, if ever, present with low polynuclear percentages irrespective of the height of the leukocyte count, while very high polynuclear percentages indicated their presence even if the total leukocyte count was low" (Sondern). This statement has since been made in almost exactly the same words by Albrecht, who, however, did his work independently. This work in the main has been verified by Gibson and Noehren, and corresponds fairly well with our experience; unfortunately these are of no negative value. Many operations for diffuse purulent peritonitis might be postponed for the surgeon's convenience were a low percentage of polynuclear leukocytes made the basis for such procrastination, as cases with a low percentage do occur rather frequently in the face of extensive spreading infections. However, in the face of a high percentage, *e. g.*, 90 per cent., operation should *never* be deferred; below 78 per cent. the condition is fairly safe for a few hours' postponement. Counts between these are a source of perplexity for the operator. However, the simple rule we have followed is the best: "Operate as soon as possible on every case."

DIFFERENTIAL DIAGNOSIS.

The differential diagnosis between peritonitis and perforative, free, spreading peritonitis cannot always be made preceding the incision, but as severe peritonitis is practically always a surgical condition, the differentiation is not so important except in special cases, as pericholecystitis, perisalpingitis, etc., and in these latter differentiation is comparatively easy.

Intestinal Obstruction. A mechanic ileus, especially if due to strangulation, may closely simulate peritonitis, and if the patient

has had previous symptoms leading to a suspicion of gastric ulcer or appendicitis, the case may be puzzling. The presence of stormy peristalsis or borborygmus with absence of fever may be considered pathognomonic, as this *never occurs in the adynamic ileus of peritonitis.* The absolute coprostasis and the more persistent, later, "fecal-colored" vomiting are equally manifest in peritonitis. Leukocytosis is usually absent in mechanic ileus, though MacDonald has reported a case of mechanic ileus with a leukocyte count of 35,000.

Thrombosis of mesenteric vessels closely simulates a perforative peritonitis, and a correct diagnosis is rarely made *intra vitam.*

Rupture of an abdominal aneurysm, hemorrhagic or gangrenous pancreatitis, acute enterocolitis, phlegmonous gastritis, Dietl's crises, and various colics may lead to diagnostic difficulties; but a careful analysis of the chronology of symptoms and accurate use of the instruments of precision with the physical signs will lead to a correct or at least to a correct operative or non-operative conclusion.

Ruptured ectopic gestation would scarcely be mistaken. The irregular intermittence, elongation of interim, or cessation of menstruation preceding the acute onset arouse suspicion. Later there are irregular colicky pains in the lower abdomen for a few days or weeks preceding the acute manifestations; with signs of internal hemorrhage—explosive in character; free peritoneal fluid, the absence of temperature, the softened enlarged uterus, with a mass in either fornix and the finding of decidual cells in the discharge; this syndrome confirms the diagnosis.

Acute pancreatitis in one of its three forms may be very difficult of differentiation. The pain located high up in the abdomen, usually a mass in the epigastrium, with muscular rigidity, early hiccough and dyspnea, and cyanosis with collapse are suggestive, and may lead to the diagnosis. When the abdomen is opened the plaques of fat necrosis indicate the diagnosis at once; these gray patches are occasionally misinterpreted as tuberculous.

Acute toxic or phlegmonous gastritis with great pain, persistent nausea and vomiting, with profound collapse and abdominal

tenderness with muscular defence are very misleading, but a knowledge of the etiology would lead to differentiation.

Pneumonia (especially in children) has caused many needless laparotomies; careful examination of the chest in all cases would eliminate this error.

From the above descriptions one might imagine that *all cases* of perforative peritonitis presented *grave symptoms in the early stage of the disease*, while the clinical facts are that surprisingly few grave symptoms were present to indicate the seriousness of the situation in occasional cases—*e. g.*, a young man with a direct appendical intraperitoneal perforation of eight hours' duration, with a large quantity of pus free in his peritoneal cavity, walked into the operating room with his physician; he complained of no severe pain, but of distress in the abdomen; his leukocyte count was 34,000. Diagnosis of perforative peritonitis was made. His appendix was perforated by a fecal concretion; there were no limiting adhesions; and the peritoneal cavity contained a large quantity of offensive fecal pus. In some cases free, purulent, perforative peritonitis was not suspected until the abdomen was opened. True, the symptomatic mild cases all came under observation in the early hours after the perforation—before absorption had time to take place. These, however, only accentuate the dangers of delay until the syndrome of collapse appears, often regarded a *sine qua non* to diagnosis.

Again, the symptoms of perforative peritonitis often occurred as a continuation of or an addition to the symptoms of appendicitis, as most of the cases have resulted from primary or secondary perforations of the appendix. We accentuate in this paper the mild symptomatic cases to encourage early diagnosis; the great majority of our cases, however, presented the painful and distended abdomen, the sunken features, the anxious expression, the flexed thighs, the thoracic respiration, etc., so classic of peritonitis.

CLINICAL RESULTS.

There is no disease in the entire field of medicine in which the many lines of treatment in the past have been so grossly at variance

as in "general peritonitis" so-called. From the physician who despaired after making a diagnosis, and exclaimed, "The case is hopeless, why operate and bring surgery into disrepute?" there are many steps to the other extreme. One opened and drained simply, another opened the abdomen and "flushed every nook and cranny," still another eviscerated the patient and sponged off every drop of pus and flake of lymph. Patients have actually been operated upon *and then placed in bath tubs filled with mild antiseptics* in the attempt to cleanse the cavity by constant washing. One urged opiates, another catharsis, one gave fluid by mouth, another by hypodermoclysis, and a third none at all; one elevated the foot of the bed "to promote absorption," another sat his patient up to retard it. Whom, I ask, shall the profession follow, and why? This divergence was attributable to imperfect diagnosis, inadequate knowledge of the physiology and pathology of the peritoneum, and finally, the hopelessness of all types of treatment in the free spreading varieties in the past.

Today one can scarcely pick up a journal without finding one or more articles on the subject, many presenting mortality statistics. It is not within the scope of this paper to tabulate results from the literature; however, we will present a few statistics, individual and hospital, gathered at random, not so much to make comparisons or draw conclusions therefrom, as to emphasize the *gravity of the disease and the appalling mortality it has had in the past.*

CLINICAL RESULTS IN THE PAST.

That diffuse suppurative peritonitis has been an extremely fatal disease is definitely shown by the older statistics. There is probably no disease, not excepting diphtheria, since antitoxin has been discovered, in which changes in treatment have reduced the mortality percentage so noticeably as the modern treatment of general septic peritonitis. The statistics of Mikulicz in perforations of gastric ulcers are given in three periods:

	Cases.	Deaths.	Per cent.
1885–1893	35	34	97
1894–1896	68	36	53
1896 { to time of his writing } cases of less than 12 hours	..	..	17
1896 { to time of his writing } cases over 12 hours	..	..	43

The prognosis depends upon many factors. The character of the microörganism, if there be but one, has some bearing. The gonococcus and the pneumococcus are in uncomplicated cases certainly the least dangerous. The Staphylococcus pyogenes aureus is a comparatively mild variety, yet not to be despised. The colon bacillus, which is present in a large majority of the cases, produces a violent and dangerous peritoneal reaction. B. pyocyaneous and streptococcus are comparatively rare varieties, but when present are extremely fatal, because of their highly toxic products and the failure of fibrin formation; the danger is especially great in the streptococcus on account of its tendency to produce a subperitoneal cellulitis. We are not giving the detailed bacteriological reports of our cases, as in many of them the cultures were made from the fluid and not from the surface, rendering them of little value from a statistical standpoint.

The location of the perforation is a very significant element, since it determines the virulence of the infection, which varies in different portions of the intestine (see chart). In the region of the appendix bacterial activity *is at its height*, and when a large number of cases are estimated they will be found fairly equal in virulence. We are convinced that one cannot justly say *this* appendical perforation was fatal because the infection was so highly malignant, and *that* recovered because the infection was mild. Variations in virulence occur, but the essentials are the patient's resistance, the quantity of irritant chemical and mechanical material which has escaped, the time which has elapsed before reaching the operating table, whether or not he has had opiates, the degree and duration of the surgical trauma, and the postoperative treatment. The same remarks are equally applicable to perforations of the stomach, duodenum, and other parts of the intestines. The location of the free spreading peritonitis has a distinct bearing on the prognosis; pelvic infections are mild; those in the diaphragmatic zone are

dangerous; between these anatomic positions various gradations exist. There is no doubt that in perforations in which small quantities of material slowly escape the bacteria can be absorbed, the infection encapuslated, and the patient recover without operation, as we have repeatedly observed in gastric ulcers, none of which are included in our series. In cases in which large quantities rapidly escape, operative results may be successful in one case and fail in another. *The rapidity with which escape takes place is a determining factor in the ultimate destiny of the case.*

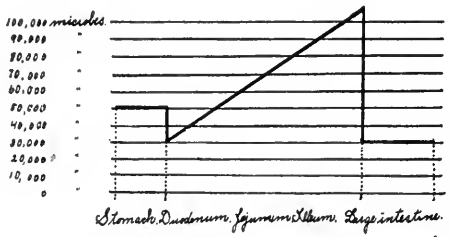

Diagram of Gilbert and Dominici, showing the relative number of micro-organisms in the dog's intestine two or three hours after a meal.

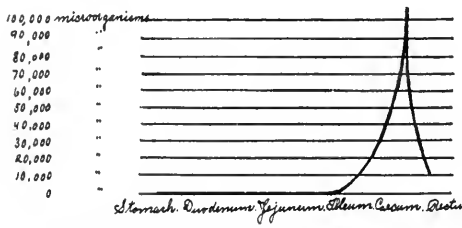

Diagram showing the relative number of micro-organisms at different levels of a dog's intestine after a prolonged fast.

von Bergmann - Bull.

The causes of death are: (1) Acute septic absorption (biotic and toxic), the earliest and most common cause; therefore, treatment is primarily instituted to prevent absorption. (2) Intestinal paresis (adynamic ileus), often a dangerous complication, as it prevents drainage and favors absorption. (3) Continuance of the peritonitis, which is in reality only a factor of 1 above. (4) Mechanical intestinal obstruction (mechanic ileus). (5) Pneumonia,

septic, due to embolic processes, or aspiration pneumonia of anesthesia. (6) Pyemia, septicemia, or pylephlebitis. (7) Exhaustion due to secondary abscesses. (8) Persistence of the primary cause, gastric ulcer, continuation of the typhoid, etc. We do not include in this paper postabortive or postparturient peritonitis, as these involve subperitoneal cellular as well as intraphlebitic processes.

Let us note how the various operators have endeavored to overcome these mortality causes and with what success.

Edwin Welles Dwight, in the Boston City Hospital (1902), reports 35 cases of diffuse peritonitis, and in a general way gives a line of treatment; the point he emphasizes is that he flushes until the fluid returns from all parts *clear;* if necessary, he uses 40 to 50 quarts of water injected through a large flushing tube. His classified statistics are as follows:

	Cases.	Deaths.	Mortality. Per cent.
Appendicitis	18	9[1]	50
Salpingitis	10	5	50
Abortions	2	2	100
Miscellaneous	5	4	80
Total	35	20	57

A. R. Thompson, in Guy's Hospital Reports (1897), records 52 cases of perforated gastric ulcer with peritonitis; 40 died, a mortality of 77 per cent. of the operated cases. The peritonitis here was from the least virulent of the digestive tract zones. He details the technique of irrigation and sponging.

Recently, Joseph A. Blake read an exhaustive paper on this subject before the Chicago Medical Society, in which he reports 99 cases of peritonitis of various etiology, and elaborated on the treatment. Of these, there were of

	Cases.	Deaths.	Mortality. Per cent.
Appendicitis	78	15	19.2

Of those that died, 7 were only superficially drained, 7 to the stump of the appendix, and 1 to the pelvis. Of the 7 superficially drained, 2 recovered from the peritonitis, but 1 died of pneumonia

[1] One of these died on the twentieth day.

on the fifth day, and the other of an "undetermined" cause on the sixth. Of the 8 deeply drained, 4 were moribund when admitted and died in a few hours; the other 4 died of sepsis and continued peritonitis.

Of 13 cases of perforated ulcers, 3, in which the perforation was over thirty-six hours old, died; another on the twenty-sixth day, of an intestinal obstruction due to adhesions, a mortality of 23 per cent. from the peritonitis. (It is to be added that these had intestinal or stomach contents in the abdomen.) Of 8 typhoid cases, 4 died, a mortality of 50 per cent.

In general, his treatment is: (1) Remove or close as rapidly as possible through a small incision the atrium of infection. (2) Wash or extensively irrigate the peritoneal cavity. (3) Use as little drainage as possible, and do not attempt general peritoneal drainage.

He believes the only drawback to irrigation, which he uses uniformly, is that it prolongs the operation; he does not believe that it entails further important trauma, nor that it spreads the pus to uninfected zones of the peritoneal cavity. As an *absolute indication* for irrigation, he mentions the presence of gastric or intestinal contents. He states that "washing accomplishes at once what is more slowly and imperfectly performed by drainage." His after-treatment is largely on our original lines, except that he prefers intermittent proctoclysis. In comparing recent results with past experience, he cautions against laying too much stress upon any one detail of technique. He says:

1. We now operate more rapidly.
2. We aim to get the patient to bed quickly.
3. We use large quantities of fluid.
4. The gastro-intestinal tract is rested.
5. The Fowler position is maintained.

All of these have marked advantages over the older methods, each contributing its share to the general good results.

Frank Torek reports 18 cases (to which he subsequently added 3), with 3 deaths, mortality 14 per cent. He says: "The pus is allowed to flow out, . . . (or) it is dipped out with guaze sponges or swabs." "After having removed the appendix, I flush

the peritoneal cavity with large quantities of saline solution *poured from bottles or pitchers.* "The flushing is done in sections, a portion of the peritoneal cavity being cleaned at a time." He actually washes the intestine "by some gentle to-and-fro motions of the hand." "Whenever fresh adhesions between adjacent coats of intestines are encountered, they must be loosened. When the lavage has been finished, I close the abdomen completely without drainage."

He had no deaths in cases operated before seventy hours after the onset of the peritonitis. The first fatal case was that of a boy, aged ten years, who was moribund when brought in four days after the onset of the disease; he died two hours after operation; the second had gone on quite nicely until the sixth day, when, for some unaccountable reason, the temperature rose and the patient died with symptoms of sepsis; the third was operated on the fourth day of an appendicitis with a very septic course; operation did not tend to diminish the symptoms. He attributes an especial virtue to the washing of the peritoneum by pouring the fluid into the cavity.

These results are certainly remarkable in view of the fact that he did not drain his cases; with such good results otherwise, one cannot help but speculate on the possibility of saving at least two of his three fatal cases had he drained them.

What *special reason* there is for considering the omission of drainage in a suppurative sac of peritoneum advantageous, when we institute it in all other types of *acute* pus cavities, we cannot understand.

L. W. Hotchkiss reports three series of cases. The first consists of 12 cases from 1895 to 1899 which were treated by "free opening, more or less evisceration, saline irrigation, and drainage." Eleven died.

The second details 15 cases with no deaths. These were treated by "rapid removal of the appendix, . . . omitting the broad protective packings of gauze to prevent soiling, free irrigation of the pelvis and lower abdomen with hot normal saline solution, and closure of wound down to a small cigarette drain which led to the pelvis and appendical site."

The third series, during the period from 1902 to 1906, consisted of 28 cases in which the pelvis and lower abdomen were washed out with a Blake tube or the jacketed glass return flow cannula. The peritoneal cavity was not drained. Five of these died; 3 were moribund when operated, 1 probably had pneumonia at the time of the operation, and another had an extensive tuberculosis of the lung. Omitting his first series, he had 43 cases, with 5 deaths, a mortality of 11½ per cent. He believes that his success is due in part to non-drainage of the peritoneal cavity.

The mortality in 161 cases of general suppurative peritonitis of appendical origin in the Massachusetts General Hospital, for a period of five years, was 66 per cent.; the number of deaths decreased from 72 per cent. in 1899 to 52 per cent. in 1900. In St. Thomas Hospital, of 100 cases flushed, 80 per cent. died; of 19 cases not flushed or sponged, 47 per cent. died, and these were mostly late cases. Harte and Ashhurst collected a large number of cases of typhoid peritonitis from the literature; a tabulation of 200 odd cases in this collection with reference to the method of treatment is interesting:

	Cases.	Recov.	Died.	Mortality. Per cent.
Drainage, no wiping or irrigation . .	17	10	7	41
Wiping and drainage	31	12	19	61
Irrigation and drainage	176	46	130	74
Wiping, irrigation, and drainage . .	11	1	10	90

While the number of cases under the above headings varies considerably, each is large enough to eliminate mere chance. It is remarkable to note how each additional procedure in the operation adds from 15 to 20 per cent. to the mortality. The procedure itself adds its quota of deaths, while the more extensive handling necessary to carry out the procedure adds an additional percentage, and finally the prolongation of the operation and the greater quantity of anesthetic swell the total to its appalling proportions.

George Woolsey reports 17 cases of typhoid perforation operated by different surgeons, including 6 of his own; 14 of these were irrigated, in 2 it is not specified; 1 was not irrigated, but the area of perforation was cleansed; 4 of these recovered, a mortality of 76.4 per cent.; of his own, 2 recovered, a mortality of 66⅔ per cent.

He emphasizes the fact that children do well in typhoid perforation, and that cases operated late often recover, probably because the type of infection is mild.

Stuart McGuire says: " . . . a record of 24 patients with diffuse suppurative peritonitis. The first 6 were treated by the old method of irrigation and multiple drainage, with 5 deaths, 87.5 per cent. The last 18 (now 22, from recent communication) were treated by the Murphy method, with but 1 death."

TREATMENT.

The details of the treatment of perforative peritonitis will be considered in the order in which appear the pathological processes that cause the mortality.

First, septic intoxication is the primary and most frequent cause of death in perforative peritonitis. The prevention of absorption is, therefore, of greatest importance. There is a pre-operative period in which much may be done to retard absorption preparatory to surgical intervention.

The pre- and postoperative importance of the Fowler position is underestimated. The patient should be placed in the Fowler position at his home the moment the diagnosis is made, and kept so until convalescence is well advanced. He should be taken to the hospital in this position to prevent the spreading of the infection to the upper abdomen during transportation, carried so to the operating room, and operated upon with at least the shoulders well elevated, if, as may be the case, the abdomen cannot be approached in the sitting position. This procedure is based on the physiology of peritoneal absorption, normal and pathological, and further discussion is not necessary.

It is scarcely necessary to dwell on the importance of peristaltic rest by withholding food (emphasized by Ochsner), or the application of cold to the abdomen, for lessening the distribution of the infective material. The use of opiates for this purpose is to be condemned, as the relief from pain experienced by the patient, the

apparent improvement in the general condition, and the mild cardiac stimulation produced give a *false sense of security leading to dangerous delays.*

Gastric lavage may be resorted to with advantage, immediately preceding the operation, if the case is twenty-four hours advanced, the operation to be performed at the earliest possible moment. In intensely poisoned and cyanotic cases a pre-operative intravenous injection of two to four pints of normal salt solution materially improves the condition.

Anesthetic. We use ether anesthesia with the drop method, given by the sister in charge of anesthetics, who has had an experience of over 8000 anesthesias. In no case did it require over seven minutes to produce complete relaxation. We feel that the anesthetic should never be started in these cases until the patient is on the operating table and all prepared for the incision; then it should be rapidly pushed to completion, but never by asphyxiation with an ether cone.

Nitrous oxide gas answers admirably for these operations, and in expert hands gives most gratifying results.

Stovaine spinal analgesias give complete relief from pain in a short period of time and stimulate peristalsis, as observed by Brewer, Moynihan, and others.

Local analgesias, Schleich and others, have been used, but they do not permit of easy intra-abdominal work, and we believe are poor substitutes for nitrous oxide gas or ether.

The Line of Incision. This is to be made over the seat of perforation when its location has been determined; otherwise it is made at the right of the median line, as the perforations are much more common in the right than in the left half of the abdomen, and the incision can be enlarged upward or downward *ad libitum* without dividing muscle fibers transversely. The manner of going through the abdominal wall is of little moment, and depends upon the individual operator's custom. For appendical cases we make the incision at the outer edge of or through the right rectus muscle, open the peritoneum quickly, and locate the point of leakage. If the duodenum or stomach be perforated, enlarge the opening immediately, as it is necessary for free work and avoids traction on the

viscera in these cases. If the appendix is suspected, it can best be brought into the field by passing the finger of the right hand outward beneath the abdominal wall to the base of the fossa, then turning inward and upward over the iliac vessels, hooking up the meso-ileum and bringing it into the field. The ileum can then be readily followed to the appendix, which saves much time and manipulation.

Closure of the Leak. If this be the appendix, for the sake of speed clamp it at its base, ligate it in the crease made by the clamp, and amputate; *burial of the stump usually entails too much time and manipulation to warrant its execution.* Return the cecum to the abdomen. If the leak be an intestinal or gastric ulcer, close by a double or triple row of Lembert sutures. In gastric cases, with considerable inflammatory induration about the ulcer, this may be difficult or impossible; in such cases close the opening by stitching a coil of the duodenum or colon over it. (Case cited below.) *Never permit the opening of a perforation to remain patent,* depending upon drainage for relief. In 18 cases of perforating duodenal ulcer, reported by Laspèyres, in which drainage alone was used without closure of the abdomen, 17 died immediately and 1 four months later from peritonitis; while of 15 cases in which the opening was closed and the abdomen drained, 5 recovered. (See article on "Perforating Ulcers of the Duodenum," *American Journal of Obstetrics*, vol. xlvi, No. 6, 1902.) Do not resect gastric ulcers in the presence of perforation. If the pylorus is involved in the induration and obstruction is likely to follow, perform a posterior gastro-jejunostomy with the button; in these cases, sew the duodenum securely over the perforation, peritoneal side in, as in the following case:

Mr. C., aged seventy-two years, referred to me by Drs. Mix and Lespinasse. Patient had complained of gastric disturbances for ten or fifteen years. Most of that time he was restricted to a milk diet. At eight o'clock on the morning of his admission to the hospital he was seized with a severe pain in the abdomen, great dyspnea, and nausea. The distress in breathing was so great that it resembled that in angina pectoris. A diagnosis of perforative gas-

tric ulcer was made, he was removed to the hospital, and at 5 P.M. he was operated. An opening large enough to admit the tip of the little finger was found in the centre of an induration two and one-half inches in diameter in the anterior wall of the stomach, the margin involving the pylorus; this induration was such as to prevent suture of the edges; the duodenum was freed by dividing the peritoneum on its outer side, it was flapped or rolled over and fixed with two rows of sutures, making a patch over the perforation. A posterior gastroduodenostomy with the oblong button was then performed. The entire operation occupied about one-half hour. A drain was inserted down to the gastric patch; the right rectus was split at its pubic attachment and a tube inserted into the recto-vesical pouch. Large quantities of gastric fluid immediately escaped through this tube and continued to escape for three days. Considerable fluid also escaped from the upper gastric drain. He was placed in the Fowler position and was given one 20 c.c. dose of streptolytic serum, hypodermically, every twenty-four hours. Proctoclysis was instituted. His recovery was uneventful and the button passed in the usual time.

The mortality from simple drainage without closure of duodenal, gastric, and intestinal perforations is such as to brand that line of treatment as inefficient and unjustifiable.

Washing removes the pus, with its myriads of leukocytes, sent there for the sole purpose of protection; if it be soon after the peritonitis has set in, the pus may contain only the harmless Staphylococcus albus. If it be late, washing will endanger the patient, in that it tends to carry virulent colon bacilli to new, unaffected parts of the peritoneum.

Irrigation of the whole cavity prolongs the operation, necessitates more or less evisceration, traumatizes the peritoneum, spreads the infection everywhere, and especially does it carry it to the diaphragmatic zone.

Dudgeon and Sargent believe that streptococcus peritonitis is a clear indication for flushing and "the most thorough possible." This is advocated because the spreading of such a peritonitis is extremely rapid, and the phagocytes are but little able to cope with

this form of infection, and may be washed away without robbing the patients of what, in other infections, constitutes the chief defence; our views on this matter have already been given. Streptococci travel through the peritoneal and subperitoneal lymph spaces freely, and cannot be washed out.

In virulent infections, gastric perforations because of foreign bodies, and intraperitoneal hemorrhage, many writers advise thorough washing, with a view of removing the foreign material, gastric or intestinal contents, and blood. This might have advantages if it could be effectually accomplished.

The author cites the following case as an illustration of the streptococcus infection. Young female admitted to medical department of Mercy Hospital, Sunday evening; had complained of intense pain in abdomen since Saturday morning; leukocyte count, 22,000. Monday morning at nine o'clock it was 34,000; at twelve, when she was transferred to the surgical department, it was 80,000; all of these estimates were made by the same microscopist. The abdomen was greatly distended, and a diagnosis of perforative peritonitis was made. On opening the peritoneum it was found intensely congested and edematous, and contained a moderate quantity of free pus. The appendix was found to be the atrium of infection; it was free from adhesions and was removed as above described; a large drain was inserted down to the pelvis; patient was placed in the Fowler position and 20 c.c. of streptolytic serum were administered at a single dose and repeated every twenty-four hours for four days; a continuous proctocylsis was instituted, and 24 to 30 pints of salt solution were absorbed each twenty-four hours. It was a pure streptococcus infection, and we believe came to the appendix from a streptococcus infection which the patient had had in her index finger two weeks before. Recovery was uneventful. *The relief of pus tension is the first surgical step toward retarding absorption in all acute infections.* The maintenance of low pressure in every pus pocket is a *sine qua non* to continued freedom from absorption. Reduction of tension *must be initial* and the *absence of pressure continuous.* These purposes are accomplished by drainage.

Drainage. Fenestrated or split rubber tubes inserted to the stump of the appendix or the site of the ulcer, and into the vesico-rectal or Douglas pouch, and any other pus pockets that may exist, is the only form of drainage permissible. Glass tubes cause strangulation, pressure necrosis, and kinks that have been a frequent cause of death. Gauze packings, drains, loose or cigarette, cease to be drains in a very few hours, and are then a distinct menace. They are to be used only to wall off intestinal contents where necrosis has occurred or is imminent, *and then only in conjunction with tubes.*

As already stated, some operators attribute an especial element of success to their *non-drainage.*

In every position in the body where a virulent pus cavity has been opened, and there has resulted a lowered temperature or a disappearance of fever, the toxic manifestations again arise when the pus becomes retained under pressure.

These principles are axiomatic in the management of acute infections in other parts of the body, and the peritoneum should be no exception. True, the peritoneum has great resistance against bacterial invasion, and can care for a larger quantity of mildly virulent infective products without drainage, but if the tension on these products is restored and they are virulent, death after operation will occur on the same basis as preceding it. Therefore, the continuation of the drainage is vital in the virulent cases, and will save many lives. The peritoneum should continue to be treated in these particulars on the same basis as infections in other portions of the body. We do not wash, scrub, knead, or traumatize acute osseous or cellular phlegmonous cavities. Why the peritoneum? The advice of Collender over a half century ago, "do not milk an abscess," was admirable, and is applicable to the peritoneum.

The abdomen is often closed with pints of pus still in the peritoneal cavity; its low pus tension is maintained by the tube, which is stitched to the lower angle of the wound or brought out through the rectus muscle.

The entire technique should be accomplished in a very few minutes, *i. e.*, get in quickly—get out quicker. Time is vital in these cases. If the anesthesia is prolonged, the manipulation great, the

sponging and flushing excessive, the patient leaves the table with a feeble capillary circulation and does not rally. It has taken fifteen years for the surgical profession to overcome the evil tendency of slow and prolonged operations advised and practised by the masters of surgical pathology twenty years ago. The records of every hospital in the period from 1889 to 1904 prove the truth of this statement; they read: peritonitis; operation; death from collapse.

The pus discharges from the tube for many days in some cases and only for a short period in others. The tube does not become rapidly circumscribed by agglutinations if the pus is virulent, notwithstanding some of the recent teachings, based on animal experiments.

PROCTOCLYSIS—ENTEROCLYSIS.

As soon as the patient is returned to bed proctoclysis is instituted and maintained until the serious symptoms of intoxication cease. The continuous method is by far the most scientific and successful. *Moderate distention* is the normal condition of the large intestine. If it is *hyperdistended*, it causes spasm and expulsion of material. The mucosa of the large intestine absorbs water with great rapidity. We have administered thirty pints of normal salt solution in twenty-four hours to a patient aged eleven years, and it was all retained. *The retention of fluid in the colon depends entirely upon the method of its administration.* We have visited hospitals numbers of times, and have been shown patients who were receiving the "Murphy treatment." We should not have recognized it without the label. It is difficult to impress doctors and nurses with the importance of details, notwithstanding that the best results are secured only by close attention to detail. The fluid should be administered through a fountain syringe to which is attached a $\frac{3}{8}$-inch rubber hose fitted with a hard rubber or glass vaginal douche tip with multiple openings. This tube should be flexed almost to right angles three inches from its tip. A straight tube must not be used, as the tip produces pressure on the posterior wall of the rectum when the patient is in the Fowler position. The tube is inserted into the

rectum to the flexion angle and secured in place by adhesive strips binding it to the side of the thigh so that it cannot come out; the rubber tubing is passed under the bedding to the head or foot of the bed, to which the fountain is attached. It should be suspended from six to fourteen inches above the level of the buttocks and raised or lowered to just overbalance hydrostatically the intra-abdominal pressure; *i. e.*, it must be just high enough to require from forty to sixty minutes for one and one-half pints to flow in, the usual quantity given every two hours. *The flow must be controlled by gravity alone, and never by forceps or constriction on the tube,* so that when the patient endeavors to void flatus or strains, the fluid can rapidly flow back into the can, otherwise it will be discharged into the bed. *It is this ease of flow to and from the bowel that insures against overdistention and expulsion into the linen.* The fountain had better be a glass or graded can, so that the flow can be estimated. The temperature of the water in the fountain can be maintained at 100° by encasement in hot water bags. The fountain is refilled every two hours with 1½ to 2 pints of solution. The tube should not be removed from the rectum for two or three days. When the nurse complains that the solution is not being retained, *it is certain it is not being properly given;* even children tolerate proctoclysis surprisingly well. We believe that, next to the conservative technique of the operative procedure, proctoclysis is second in importance as a life-saver. It rapidly restores blood pressure, it improves the capillary circulation, it quiets the thirst, it eliminates the septic products, and increases the excretions. All of the details are simple, but they *must be carried out with precision to secure the best results.* If the patient has a tendency to vomit, is nauseated, or shows evidence of gastrectasis, lavage should be practised and repeated often if the stomach refills with fluid.

Serum Treatment. Antistreptococcic serum is beneficial in those cases where local resistance is meagre and the leukocytic reaction feeble. It is decidedly indicated in the streptococcic cases. Colon bacillus vaccines controlled by opsonic index, after the practice of D. J. Davis, of Chicago, are capable of raising the index to four or five times the normal. This work, however, is yet in its infancy, and,

until we can get a means more simple than the opsonic index to avoid inducing the negative phase, these vaccines will be little used.

As before described, the protective peritoneal injections of nuclein, oils, etc., open another field for extensive experimental and clinical observation.

We have used the streptolytic serum in a large percentage of our cases, and we believe with beneficial effect; 20 c.c. are injected immediately after the operation, and the same quantity each succeeding twenty-four hours until the patient is out of danger.

Dressings. The dressings should be changed as often as is necessary for the comfort of the patient. Once every twenty-four hours the tubes should be rotated a trifle, first to the left and then to the right, to prevent closure of the fenestræ by adherence of omentum or intestine. Suction, irrigation, and pyrozone injections are unnecessary and dangerous, as the plus abdominal pressure forces the pus out.

DRUG TREATMENT.

Opium and its derivatives and coal-tar anodynes were never given either before or after operation. While opium might be a valuable aid in retarding peristalsis, thus circumscribing the process in the early stage, it also adds to the intestinal retention. The toxic absorption, which is sufficiently great as it is, has then added to it the retention of poisons in the intestines, where absorption continues; finally a dose of morphine is superadded, which may be just sufficient to turn the tide against the patient.

Dudgeon and Ross (quoted by Dudgeon and Sargent) have shown that leukocytosis is markedly inhibited by morphine.

Adrenalin, strychnine, camphor, or caffeine are the most valuable stimulants in the order named, but are rarely given. The intravenous infusion of 800 to 1000 c.c. of salt solution, with six drops of adrenalin, is strongly recommended by Heidenhain for restoring the blood pressure and overcoming collapse.

Calomel in one-eighth grain doses may be given at short intervals (every ten to fifteen minutes) until two grains are administered.

Ileus is a frequent, very annoying, and often dangerous complication. The *adynamic type* (due to the paresis of the intestine as a result of the peritonitis), with its coprostasis and tympany, is rarely associated with nausea and vomiting. Tympany is marked, and "gas pains" recur frequently; continued postoperative tympany is always indicative of danger. Inability to expel flatus or feces often continues for days after operation. The symptoms become most urgent at the end of the second and the beginning of the third day; if still continuous, they become alarming and the condition is dangerous. Statistics show that ileus is an extremely common cause of death. If nausea and vomiting are present, gastric lavage must be practised, bearing in mind that repeated emesis of small quantities indicates an overdistended stomach, analagous to the incontinence in overdistention of the urinary bladder. The treatment of this condition consists of repeated carminative or saline enemata. High enemata of alum water ($\frac{1}{2}$ ounce dried alum to the quart of water) have been found effectual in our work; they stimulate peristalsis in the large intestine and often give relief, and should always be given with a fountain syringe, never with a bulb. Medicinally the best results are obtained by hypodermic injections of physostigmine (eserine) salicylate repeated every two hours in doses of $\frac{1}{60}$ to $\frac{1}{40}$ grain. We consider the hypodermic injection of atropine sulphate, $\frac{1}{60}$ grain, repeated every three hours until constitutional effects appear, next in efficiency. If these methods fail, the case is indeed desperate, and the possibility of a mechanic ileus must be considered.

The symptoms of mechanic ileus are essentially the same as under other circumstances, but in practice it is difficult to say when a condition ceases to be adynamic and becomes mechanic in character. Pain, wave-like and colicky, increasing frequency of emesis until it becomes a gulp every two or three minutes, is the clinical picture. The vomitus is never fecal, but often of offensive odor. The meteorismus increases with time, the degree of distention depending somewhat upon the length of intestine above the seat of obstruction, all of which is distended with gas and fluid. In the early stages of the obstruction stormy peristalsis is manifest, but becomes less and

less as the intestine becomes fatigued. Borborygmus is one of the most positive signs of mechanic obstruction; it is never present as a result of continued peritonitis or paralytic ileus. Coprostasis is persistent; at first there may be small quantities of feces passed after enemata; this is merely the material in the lower bowel, and might mislead, especially if an inexperienced nurse reports "a bowel movement." Gastric lavage may stop the vomiting and give a fallacious sense of security. There is no more perplexing problem in all surgery than to decide when to reopen the abdomen with symptoms of postoperative ileus; the more experience one has the more one appreciates the inadequacy of diagnostic guides. If the treatment for adynamic ileus described above fails to produce results within a limited time, it should be assumed the obstruction is mechanical and the abdomen reopened, meeting indications on a basis of general principles. Such cases should never be permitted to go to the stage of capillary cyanosis, a definite sign of intense intoxication and approaching dissolution. In our series of 49 cases (the last one operated by the author's associate, Dr. Neff, during his attendance at the meeting), we have had 6 of postoperative ileus; 3 were relieved by removing the stitches and incising a distended intestinal coil at the side of the drainage tube after staying it with two or three through and through silk sutures. This relieved the tension; feces escaped for a few weeks, and the opening healed in each case without intervention. In continued excessive tympany, with anxious expression, rapid breathing, and little capillary stasis, the wound should be reopened and an enterostomy performed as above, even when the ileus is adynamic. It favors drainage and lessens absorption. A fourth case was operated out of the city; the patient had an obstruction five weeks after the operation, and died of collapse six or eight hours after an operation for the obstruction; this is not included as a death from suppurative peritonitis, as the patient was not under our immediate observation, and the death was so long after and independent of the peritonitis.

CASE XLVI.—(Fifth case of ileus.) A very fleshy man with peritonitis from direct perforation of appendix into free peritoneum, operated twenty-seven hours after perforation and fifty-eight hours

after the onset of the appendicitis; diffuse and spreading peritonitis; offensive pus throughout; appendix removed in the usual way; deep pelvic drain; the patient had an old right inguinal hernia, which was not disturbed. Left the operating table in good condition. The abdomen became gradually more and more distended; the evening of the second day there was some emesis, relieved by lavage. Peristalsis was active, but there was no bowel evacuation; on the morning of the third day the emesis was more frequent, pulse 120, capillary circulation good, no bowel movement of importance, although interne and nurse reported passing of flatus. Patient was taken to the operating room and we could not conclude that it was a mechanic ileus, and he was returned to his room. At nine o'clock the night of the third day, eighty-two hours after the operation, his capillary circulation began to change, and the emesis became more frequent. The pulse had quickened to 138. The abdomen was opened in the middle line. A gangrenous coil of intestine fourteen inches in length was found, which ruptured on lifting it out of the cavity; the gangrene was due to the twisting of the coil around the omentum, which had become adherent to the old hernial opening, using the omentum as a turning pole, thus compressing the omentum and stopping the circulation, causing gangrene, while the lumen of the bowel was free and permitted the escape of gas as reported by the interne and nurse. The peritoneum was entirely free from pus. The gangrenous coil was freely opened and retained in the wound with rubber tubes in the proximal and distal ends. The capillary circulation was extremely poor at the completion of the short operation, and the patient died seven hours later. This death was due to our inability to differentiate between adynamic and mechanic ileus, notwithstanding that the patient was under our direct observation.

Case XXXVII.—I. I. was admitted to the Presbyterian Hospital Sunday, November 24, 1906. On Sunday, November 17, the patient complained of headache and severe pain in the abdomen, shortly followed by vomiting. His abdomen became sore; he had some fever, but a doctor was not called. He remained in bed two days, Monday and Tuesday. Friday he did not feel so well, and Saturday,

the 23d, he was attacked with severe pain in the region of the umbilicus. A few hours later he vomited, his pain became intense, and continued throughout the day. He had eaten nothing since Friday afternoon, as he felt indisposed toward evening. He had a high fever Saturday evening and Sunday forenoon. He was prepared for operation at nine o'clock Sunday evening, November 24, seven days after the onset of his trouble and thirty-three hours after the occurrence of his perforation. The abdomen was opened and a large quantity of offensive pus escaped immediately on incising the peritoneum. The appendix was found near the brim of the pelvis, its end was free from adhesions, and an opening existed communicating directly with its lumen. The area of gangrene was not more than one-half inch in length. The offensive pus was throughout the exposed field and pelvis, and a large quantity welled up from the pelvis. The appendix was excised in the usual way. A large drainage tube was inserted into the vesicorectal pouch and brought out through the wound. The patient's abdomen was very much distended, and considerable tension was exerted on the sutures. Microscopic examination showed pneumococci and staphylococci; no streptococci. Proctoclysis was continued for four days. Adynamic ileus was a marked feature in this case, but a secondary opening was not resorted to.

May 1, 1908, seventeen months after the peritonitis, the patient presented himself at clinic, at twelve o'clock, complaining of pain in the abdomen, nausea and vomiting, which had been present since three o'clock the previous afternoon. The abdomen was distended, and there were areas of circumscribed flatness on piano percussion. Dr. Neff was conducting the author's clinic. He made a diagnosis of intestinal obstruction, immediately opened the abdomen, and found the ileum rotated two-thirds of a circle on itself, looped for ten inches, and bound down by adhesions. A flexion occurred at the proximal part of this rotation and fixation, which produced the obstruction. After freeing the adhesions, the ileum was lifted and the abraded surface fixed to a neighboring coil and covered with omentum. The patient made an uninterrupted recovery. This is the sixth case of ileus in the 49 cases operated.

Pulmonary complications, even bronchitis, were very rare. We had one case of double pneumonia, No. 16 of our series.

Girl, aged five years, operated on third day of appendicitis, twenty-fours after the onset of a general suppurative peritonitis. The appendix was gangrenous and perforated. The opening communicated with the free peritoneal cavity. The abdomen was enormously distended and the quantity of pus great. The pulse was 140, temperature 104°, capillary circulation fair. The drainage was free and profuse. The tympany rapidly subsided, and on the fourth day the abdomen was scaphoid, the bowels were moving regularly, and the patient was considered quite out of danger. That evening she developed pain in the right side, with a few rales; next morning there was considerable consolidation of the lower lobe, with beginning pain in the left side; by evening the left lower lobe was rapidly consolidating. The morning of the sixth day respirations were 80, pulse 160 to 170, severe dyspnea and cyanosis, abdomen flat, bowels moving, no emesis. She died on the evening of the sixth day from a double pneumonia.

We have included in this paper only such cases of spreading, free peritonitis as resultsed (*a*) from direct communications of the alimentary canal into the free peritoneal cavity, (*b*) perforations of the appendix with primary retention of the infective material in a circumscribed zone and subsequent rupture into the free peritoneal cavity, so that there resulted a communication from the intestine, through the appendix, and through the abscess into the free cavity. We do not include any cases of peritonitis with circumscribed abscess not communicating with the free peritoneal cavity, no matter how much pus was present in the general cavity. If we did, the number would run into the hundreds. Many times with circumscribed peri-appendical abscesses and circumscribed perigastric abscesses there are large quantities of pus in the free cavity, usually of the staphylococcus albus type. This is not considered a general suppurative peritonitis nor a perforative peritonitis; it is a circumscribed abscess with defensive pus in the free cavity, and is a less dangerous condition than if no pus was present in the cavity around the circumscribed abscess.

The cases included in this series cover a period of a little over five years, since the institution of our present plan of treatment, and practically all of them have been managed in identically the same way. They have all been operated in public institutions, in my ward and private service, the records of which are open for inspection. Four of the cases were operated in my service by Dr. J. M. Neff and one by Dr. Charles J. Rowan, my associates.

There were 49 cases in all operated: 2 were gastric perforations, 1 duodenal, 4 typhoid, and 42 appendical. The 16th and the 46th cases died, the first from a double pneumonia on the sixth day after the operation (cited above), the second from a mechanic ileus and strangulation of the intestine around the omentum, which was adherent to an old hernial opening (also cited above).

The severity of these cases may be estimated from the fact that 7 had to be re-operated for circumscribed accumulations of pus in various parts of the abdomen; 6 had to be re-operated for mechanic ileus—making 26½ per cent. of cases requiring a second operation.

In each of the circumscribed abscess cases there was a return of the temperature, local tenderness, and local and circumscribed resistance, but in none was there a development of a second general peritonitis. The occurrence of secondary abscesses indicates that even the Fowler position and pelvic drainage were not ample to avoid circumscribed accumulations of pus; these, however, are about as easily relieved by drainage as any local phlegmons. The duration of the discharge of pus varied greatly, lasting in some of the appendical cases as long as three weeks.

The gastric contents escaped from the pelvic drain as long as three days, as shown in case of Mr. C. cited above. There were no fecal fistulæ.

The period of time that elapsed between the moment of perforation and the time of operation varied considerably. In the duodenal case it was eight hours, and the leukocyte count was 23,400 just preceding the operation, showing that, notwithstanding the supposed mild virulence of the peritonitis in the duodenal cases, there was a high leukogenetic response.

The gastric perforations were operated eight and fourteen hours respectively after the perforation.

In the direct perforations of the appendix into the free peritoneal cavity one can accurately estimate the time of perforation, but in the circumscribed abscess variety it is difficult to say just when the abscess ruptured into the free peritoneal cavity. We based our calculations in these cases on the sudden increase in pain, enlargement of inflammatory zone, nausea and vomiting, interposed on an already existing clinical case of appendicitis. On this basis of calculation a period of forty hours was not exceeded from the time of the perforation to the operation, while many of them had suffered from the appendicitis for three, four, five, six, and even seven days. The degree of abdominal distention, intensity of intoxication, or facies Hippocratica were no indexes to the length of time that had elapsed since the free perforation, as many cases of circumscribed abscess have all these symptoms. The earliest operation was three hours after the onset of the perforation symptoms, the latest forty hours; twenty-two to thirty hours was the most common period.

The author wishes to thank the family physicians for reference of cases and to congratulate them on their early diagnosis and prompt demand for surgical relief in these cases, and to them he feels belongs much of the credit for the good results secured, as in this class of cases early diagnosis and early surgical intervention are indispensable to success and are truly life-saving.

There were no deaths from the peritonitis *per se*. When the plan of treatment outlined was first instituted, we believed the recoveries were coincidents. Now the number is so large and the results so uniform that we cannot refrain from concluding that they are the legitimate sequelæ of the treatment. Contrast the results of the last five years with those of the preceding five. The infections in perforations of the alimentary canal, we believe, have been and will be practically the same each succeeding decade; therefore, we cannot attribute the results to a change in the virulence in the infection. We believe also that the constitutional resistance, and the individual and the local immunities are the same as they were in the preceding decades. We know of the appalling mortality which

accompanied perforative peritonitis in every decade of the last century. We know that it is less than ten years since we announced that these cases of general diffuse free peritonitis would practically always prove fatal. We apologize for our predictions. We believe, and that belief is based on the facts cited in this paper, that the results of the future can and will be uniformly good. This estimate involves the assumption that the medical profession will make early diagnoses, will insist on early surgical intervention, will limit its surgical procedures to the least possible handling and trauma consistent with closure of the opening and relief of pus tension, will limit the durations of anesthesia and quantity of anesthetic, will shorten the actual time of operation, will insure the continued absence of pus tension, will eliminate the sepsis already in the blood, restore the blood pressure, and will inhibit septic absorption by position.

None of the above can be considered, individually, a life-saver, but each plays an important role in securing the present good results.

BIBLIOGRAPHY.

Muscatello. Virchow's Arch., 1895, Band cxlii.
Kolossow. Arch. f. Mikrosk. Anat., 1893, Band xlii.
Muscatello. Virchow's Arch., 1895, Band cxlii.
MacCallum. Johns Hopkins Hospital Bulletin, 1903, vol. xiv.
Wegner. Langenbeck's Archiv, Band xx.
Durham, H. D. Medico-Chirurgical Transactions, 1897, vol. lxxx, p. 191, and Journal of Pathology and Bacteriology, vol. iv, p. 338.
Buxton and Torrey. Journal of Medical Research, vol. xv, p. 5.
Buxton. Ibid., 1906, vol. xv, p. 18.
Buxton. Ibid., 1905, vol. viii, p. 305.
Dudgeon and Ross. Amer. Jour. Med. Sciences, 1906, vol. cxxxii, p. 37.
Bail. Arch. für Hygiene, 1905, lii, p. 272.
Hoke. Centralblatt für Bakteriologie, 1903, xxxiv, p. 693.
Tavel and Lanz. Mitth. a. Klin. und Med. Inst. d. Schweiz, 1893, Band i.
Gruber and Durham. Wiener klin. Woch., 1896.
Mayo-Robson. British Medical Journal, 1903, vol. ii, p. 242.
Durham. Journal of Pathology and Bacteriology, 1896-97, vol. iv.
Fraenkel, A. Wiener klin. Wochenschrift, 1891, Nos. 13 to 15.
Pawlowski. Virch. Arch., Band xlviii.
Waterhouse. Ibid., Band cxix.
Grawitz. Charité Annalen, 1886, Band xi, s. 770.
Wegner. Arch f. klin. Chir., 1887, Band xx.

Rinné. Ibid., xxxix, s. 1, and others.
Walthard. Arch. f. Exp. Path. und Pharm., 1892, xxx, s. 275.
Rinné. Arch. f. klin. Chir., Band xxxix.
Dudgeon and Sargent. Bacteriology of Peritonitis, 1905.
Laruelle. La Cellule, 1889, vol. lxi.
Malvoz. Arch. de Méd. Exp., 1891, iii.
Klencki. Ann. Instit. Pasteur, 1895, ix, p. 710.
Corner. Erasmus Wilson Lectures, 1904.
Lessage and Macaigne. Arch. de Méd. Exp., 1892, iv, p. 350.
Kelly, A. O. J. Philadelphia Medical Journal, 1899, vol. iv, p. 1032.
Low. Medical and Surgical Reports, Boston City Hospital, 1900, p. 173.
Lartigau. Studies from Department of Pathological College of Physicians and Surgeons, Columbia University, 1900-02.
Corner, E. M. Erasmus Wilson Lectures, 1904.
Cushing, Harvey. Johns Hopkins Reports, 1904, vii, and Johns Hopkins Bulletin, May, 1899, p. 75.
Dieulafoy. Clinique Médicale de la Hôtel Dieu, 1898, p. 396.
Ghon. Wien. klin. Wochenschrift, 1904, xvii, p. 267.
Veillon and Zuber. Arch. de Méd. Exp., July, 1898.
Fraser and Bowen. Lancet, 1906, vol. i, p. 1591.
Ashdowne. Ibid., p. 155.
Cushing. Johns Hopkins Bulletin, May, 1899, p. 75.
Young, Hugh. Johns Hopkins Reports, 1900.
Goodman, Charles. Annals of Surgery, 1907, vol. lxvi, p. 161.
Flexner. Philadelphia Medical Journal, November 12, 1898.
Veillon and Zuber. Arch. de Méd. Exp., July, 1898.
Tavel and Lanz. Revue de Chir., Paris, 1904.
Schnitzler and Ewald. Deutsche Zeitschrift f. Chir., Band xli.
Clairmont and Haberer. Arch. für klin. Chir., Band lxxvi.
Glimm. Deutsche Zeitschrift f. Chir., Band lxxxiii.
Munro, J. C. Keen's Surgery, vol. iii, p. 767.
Peiser. Brun's Beiträge, Band xlv.
Issaeff. Zeitschrift f. Hyg., 1894, xvi, p. 287.
Exner. Zeitschrift f. Heilkunde, 1903, xxiv, p. 302, and Arch. f. Exp. Path., 1903, Band l.
Wells and Mendel. American Journal of Physiology, 1907, xviii, p. 156.
Meltzer and Auer. Transactions of the Association of American Physicians, 1904.
McGuire, Stuart. Journal of the American Medical Association, March 28, 1908.
Laspèyres. Perforating Ulcers of the Duodenum, American Journal of Obstetrics, 1902, vol. xlvi, No. 6.
Heidenhain. Mitt. Grenz. der Med. und Chir., 1908, Band xviii.
Klapp. Arch. f. klin. Chir., lxxv, Heft 1.
Mikulicz. Ibid., 1904, lxxiii, p. 347, and Verhandl. d. XXXIII Kongress d. Deutsche Gess. f. Chir., 1904.
Borcharht. Deutsche med. Wochenschrift, 1904-1906.
Diez and Compara. Giorn. Assoc. Med. Tor., 1906, lxix, p. 53.
Glimm. Deutsche Zeitschrift f. Chir., Band 1906, lxxxiii.

Buxton and Torrey. Journal Medical Research, 1907, vol. xvii, p. 1.
Vaughan. Medical News, December, 23, 1893.
Lennander. Deutsche Zeitschrift f. Chir., Band lxiii, 14.
Lennander. Mittheil. a. d. Grenz. d. Med. u. Chir., 1902.
Lennander. Deutsche Zeitschrift f. Chir., 1902; Ibid., 1906.
Sondern. American Journal of Medical Sciences, 1906, cxxxii, p. 889.
Albrecht. Zeitschrift f. Geburtsh. u. Gyn., 1907, Band lxi, Heft 1.
Gibson. Annals of Surgery, April, 1906.
Noehren. Ibid., February, 1908.
Mikulicz. Quoted by Inter. Text-book of Surg., p. 324.
Blake, Joseph A. Amer. Jour. Med. Sciences, vol. cxxxiii, p. 454.
Torek, Frank. Med. Rec., 1906, vol. lxx, p. 849.
Hotchkiss, L. W. Annals of Surgery, 1906, vol. xliv, p. 197.
Publications. Massachusetts General Hospital, February, 1906.
Harte and Ashhurst. TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION, 1903, vol. xxi.
Woolsey, Geo. Annals of Surgery, 1906, xliii, p. 652.

DISCUSSION.

Dr. John B. Deaver, of Philadelphia.

There is no question that Dr. Murphy's line of treatment has been responsible for saving more human lives than has any other line of treatment in peritonitis. Dr. Murphy emphasized, not so much the presence of the infection as the disposition of that infection, the necessity of primarily attacking the case early, and, secondarily, of doing as little as possible. In line with what he has said, I say to my students: "Get in as quickly as you can, stay in as short a time as possible, and get out in the least possible time." This, I believe, is the secret of success. It falls to my lot to operate upon quite a lot of these cases, and visiting doctors often say: "You haven't done anything." The important point is to relieve the condition, remove the focus of infection, and close the abdomen, introducing drainage where there has been pus for some time. Frequently the abdomen is closed without drainage. In many of these cases that I open I introduce a drainage tube and do nothing more, and see them recover.

I attach the greatest amount of importance to the use of saline solution. In 676 cases of acute appendicitis the proposition of intestinal obstruction was 1 to 40. These cases usually occur in from 1 to 10 days after operation. The mortality in a series of 10 has been *nil*. In other series it has been 25 per cent. It is my practice after abdominal section, particularly for sepsis, and particularly if the patient previously had nausea and vomiting, not to delay, but to immediately reopen the abdomen. I have great confidence in the aseptic scalpel of the surgeon, and have no hesitancy in reopening an abdomen. Up to this point I have not opened such an abdomen in which I have not found obstruction. I have had 10 successive cases, all of which recovered.

Anesthesia in these cases is very important, and we must all know that short anesthesia is what we should aim for. I use eserine in intestinal paresis, reinforced with strychnine. In some cases there has been slight cardiac disturbance from the eserine. I have no hesitancy in sitting my patients up in bed. I do not know what a hypodermic syringe looks like for the purpose of giving morphine, and any house doctor who errs in this respect is told that his services are not needed.

I am very sure that I am able to do more for my patients than formerly, because of the more modern surgery of Murphy.

Dr. A. G. Gerster, of New York.

Every word almost that we heard said by Dr. Murphy can be verified and characterized by me as valuable in the treatment of suppurative

peritonitis due to perforation. In the very large amount of material that comes to me in my service at the Mt. Sinai Hospital, those due to perforative peritonitis and appendicitis, which Dr. Murphy has well said present the most virulent form of peritoneal infection, amount annually to between 300 and 450 cases. In the last two years, having employed in former years irrigation and mopping out of the peritoneal surfaces, we have abandoned all such methods, following the plan laid down by Dr. Murphy, with the Fowler position. We do the operation as rapidly as possible, and with as little interference as possible with the peritoneal surface, and our results have been markedly improved with this change in treatment.

In the treatment of the tympanitis, following diffuse peritonitis, I have used eserine, but I am not as enthusiastic as some about the results.

In the improved results, in the treatment of general peritonitis, it should be remembered that these results are due to the improved technique, but also to the fact that the general practitioner recognizes much more readily than formerly cases of perforative peritonitis, and that a perforative peritonitis, recognized early, is very easily cured by proper treatment.

One thing which I can recommend very warmly is a simple modification of the enema, which is more effective than either the low or high enema. It is "Darmspülung," the irrigation of the rectum by the introduction of a rectal tube, and the injection of a certain quantity of liquid high up in the rectum, and, after permitting that quantity to escape, to allow a short pause and then repeat the injection. Two to four gallons of water may be used in this way. By this plan peristalsis is provoked sooner or later, and large quantities of gas are expelled. It is much more effective than the use of eserine, and, being a mechanical procedure, can be intrusted to the nurse.

I believe that Dr. Deaver takes an extreme stand in regard to morphine, and that he is depriving his patients of one of those things that we medical men principally exist for—relief from pain. I believe we owe that to our patients. I believe also that as excessive administration of morphine is wrong, so the withholding of it is unnecessary and cruel.

Dr. Arthur D. Bevan, of Chicago.

In some of the appendix cases, in which we have free fluid in the peritoneal cavity, we use in our clinic a glass female catheter, using it as a pipette for testing for pus, not only in the cul-de-sac, but in other directions. Many cases in which free pus is found, and cases of perforating and gastric duodenal ulcer operated upon early, in which we find a considerable amount of turbid fluid, are not necessarily cases of general peritonitis. If they are operated upon early, the leak closed,

and the fluid removed, they are, to my mind, rather to be regarded as cases in which general peritonitis has been prevented by early interference. Some men would count these as cases of general peritonitis, because, if uninterfered with, they do go on to general peritonitis and death.

We have been using recently in our service nitrous oxide gas as an anesthetic in cases of peritonitis and perforation, and I am convinced that this is of importance. Frequently the giving of either ether or chloroform in these cases turns the scale between the possibility of recovery and death. Almost all of this work can be done under nitrous oxide gas, with much less danger than from ether or chloroform.

I cannot agree with Dr. Murphy as to the uselessness of washing out the peritoneal cavity. To my mind that is a very important point, and I believe that in cases of perforative peritonitis the noxious, often fecal, material in the peritoneal cavity can be washed out without any real loss of time, and that this is often a life-saving action. While the wound is being closed, we usually make a button-hole opening immediately above the symphysis, introduce a glass drain at that point, and a glass drain at the other wound, and, while we are finishing up the operation, we allow a gallon of normal salt solution to pass through the peritoneal cavity. I am satisfied that this is good surgery and will save a certain number of cases without doing any harm.

I am thoroughly in favor of large cigarette drains rather than rubber tubing, because pressure necrosis and intestinal fistulæ sometimes follow the use of rubber tubing. In our service in the last four or five years we have been able to save 70 per cent. of these cases, in which we found free pus and noxious fluid in the peritoneal cavity, where formerly we had certainly as much as 70 per cent. mortality.

Dr. Dudley P. Allen, of Cleveland.

I agree with most of what Dr. Murphy has said. I think, however, there are certain cases in which the washing out of septic material is of value. The two indications for the successful treatment of peritonitis, with collections of pus, are: (1) thoroughly to remove the septic material; and (2) to avoid the disturbing of any existing adhesions with the possibility of infecting new areas. When the peritonitis is caused by a perforated appendix it is extremely difficult to tell to what distance infection may have extended. The incision is, however, as a rule, made over the cecum. If pus is found, and one is suspicious that the abdominal cavity is widely invaded, the immediate removal of the pus is, in my judgment, desirable. My method of treating such cases is to turn the patient immediately upon the right side, so that the incision becomes the most dependent point of the abdominal cavity. With the left hand

in the opening, the escape of the intestines is prevented and a large exit for pus is insured. If the pelvis is filled with pus, two glass drainage tubes are usually carried from the incision into the pelvis. With the patient lying on the right side, the course of these tubes is obliquely upward. While in this position there is free flow of pus from the tubes. A hard rubber tube is then inserted, to which is joined a soft rubber tube with a funnel. The funnel is held but a little above the level of the patient. With the wound held widely open with the hand, often aided by retractors, and the drainage tubes in the pelvis, the water which flows in has ample exit and does not tend to carry the pus beyond any limiting adhesions which may exist. The washing is ordinarily done before any attempt is made to remove the appendix. When the field has been cleansed, it is possible, quickly, to lift the cecum sufficiently into the field to make the removal of the appendix and the closing of the opening into the cecum possible. The same process of washing is repeated, and the two glass drainage tubes are left extending upward into the pelvis and a third is sometimes run longitudinally upward toward the patient's liver. The patient is kept upon the right side throughout the operation, and subsequently retains this position in bed until the drainage seems to be complete. At the end of twenty-four hours one drainage tube is removed, and within another twenty-four hours the second, an iodoform wick being left as the tube is removed.

The advantages of this method are: (1) all septic material is washed away with the greatest possible care; (2) as the exit provided for the return flow of water is more abundant than that at its entrance, the water does not carry the infection into other portions of the abdomen; (3) the opening into the abdomen is at the lowest point in the cavity; and (4) the lateral position is more easily preserved, and I believe more comfortable for the patient, than the sitting position. A large experience gained in operating by this method assures me that it will produce results equal, at least, to those which can be gained by any other.

Dr. Joseph Ransohoff, of Cincinnati.

I fear that if there goes out to the general profession the dictum that free general peritonitis gets well in the proportion of 44 to 3, the average practitioner will hesitate very much about seeking surgical counsel, thinking that if the patient does get worse he has 44 out of 47 chances of getting well. This, I think, is dangerous teaching. When Dr. Murphy closes the discussion, I hope he will tell us in how many of these 47 cases the operation was done four or five days after the development of symptoms of general peritonitis. If cases are excluded that have been operated on after six or seven days, when the abdomen is very much distended, when there is regurgitant vomiting; when

there is evidence of ileus; when, if the abdomen is opened, the intestines are so crowded that it is anything but an easy matter in the hands of the most expert to find the seat of the perforation and close it, we ought to know it. I spoke to a gentleman who had occasion to see a man taken to him on the sixth day after an attack of appendicitis. The man doubtless was in a bad condition, but the surgeon did not operate. Asked why, he said, "I was afraid." The question is whether we are to exclude from our list those bad cases which we see five or six days after the inception of the disease. I should like, therefore, to ask Dr. Murphy in what proportion of cases of general peritonitis he operated after the fifth or sixth day, and in how many he operated in cases in which death seemingly was imminent. Perhaps he will say these cases are already "dead." But a man who is nearly dead ought to have an opportunity of getting well by surgical intervention.

Another point to which I would call attention is the general use of the word peritonitis. Perhaps there are not three men in this hall who understand by that term exactly the same thing. If in three or four days after one sees a case of appendicitis, or if after forty-eight hours one opens the abdomen, it is not unusual to find free fluid in the pelvis. Such cases ought never to be called cases of peritonitis until cultures made from that fluid show it to be infected. The free fluid in the peritoneum, even though turbid, is not necessarily infected. It, however, becomes infected from the abscess, and then we have general peritonitis. There is no more justification for calling free uninfected fluid in the peritoneum a sign of peritonitis, than to call a dropsy of the subcutaneous tissue in the leg a phlegmonous condition. This subject is exceedingly important, but most important is the fact that the dictum shall not go out from this organization that peritonitis can be cured in practically every case. Most of us, unfortunately, are so situated that we see many cases that have progressed five to seven days and which are so ballooned that the intestines pop out as soon as the peritoneum is opened. In such cases there is a dynamic ileus, and it requires very great discernment to locate with ease—and sometimes we cannot locate at all—the site of perforation. I should like to have Dr. Murphy tell us whether he excludes these cases.

Dr. A. T. Bristow, of Brooklyn.

In connection with the subject of saline infusion in these cases I should like to describe a little device used at the Kings County Hospital, by which the infusion can be given for rectal absorption without overflow occurring. An ordinary glass syringe, from which the piston is removed, is fitted with a cork. Through the cork is inserted an ordinary medicine dropper. The rubber tube of the douche bag is connected

with the medicine dropper, and the tube to rectum with the nozzle of the syringe. A hard rubber stopcock in the tube, between the reservoir and the dropper, regulates the flow exactly. The exact rate of the discharge may be observed through the glass syringe, and may be adjusted to the capacity of the bowel for absorption.

DR. G. E. ARMSTRONG, of Montreal.

I have adopted Dr. Murphy's method in the treatment of general suppurative peritonitis for about three years, and with very great improvement in results. Unquestionably, drainage, rectal salines, and the Fowler position are important details in addition to the avoidance of the flushing and wiping out of the abdomen. I do not think that a knowledge of the bacteria present in any given case of general peritonitis will afford very much help in giving a prognosis, but I am under the impression that we must look to bacteriology for an explanation of the much larger percentage of recoveries obtained when flushing and swabbing of the peritoneal cavity are omitted. Bacteria naturally tend to die out. They are constantly producing toxins—some within themselves and some without themselves—some soluble and some insoluble, that sooner or later cause their death. When we open the abdominal cavity and wash out the pus, we, at the same time, wash out the accumulated toxins which are killing the bacteria. The bacteria then have a fresh start and a clean field. We have done the best thing possible for the bacteria, and the worst thing possible for our patient. We cannot remove all the bacteria. That is out of the question. We cannot remove all of the bacteria from a polished surface of steel by wiping, much less from a serous membrane. In the same way I would explain the not infrequent reports from the bacteriological department, that the pus removed from the abdominal cavity, in cases of general peritonitis, is sterile. Drainage in the upright position is important; it relieves tension and so favors the reëstablishment of the circulation, through the blood and lymph vessels, and gives the phagocytes a chance to do their work.

I have recently had under my care two cases of generalized peritonitis treated in the Fowler position with drainage, in both of which the subsidence of all the acute symptoms, the thorough movement of the bowels, and the flattening of the abdomen was followed by a recurrence of distressing vomiting and marked visible distention in the epigastric region. I thought the condition was probably that of arteriomesenteric pressure on the transverse duodenum, causing duodenal and gastric obstruction. Whether I was right or wrong in my diagnosis I cannot say definitely, but in both cases the symptoms promptly disappeared when I reversed the patients, putting them in the Trendelenburg posi-

tion. They both went on, then, to a smooth and uneventful recovery. It is quite possible that a general use of the Fowler position may show that this is a possible complication that we must be on the lookout for. If so, its recognition will suggest the remedy.

Dr. John C. Oliver, of Cincinnati.

It occurs to me to ask Dr. Murphy whether this method of treatment has ever been applied to gunshot wounds of the abdomen, especially to those cases in which the injury has been inflicted several hours before the operation. I ask because there may be a very honest difference of opinion as to the forms of peritonitis following an appendicitis or perforated gastric or duodenal ulcer; but all agree that the form of peritonitis following gunshot wounds is apt to be general. The results of treatment in that class of cases would be of value.

Dr. James E. Moore, of Minneapolis, Minn.

I have no word of criticism to offer of Dr. Murphy's paper. I only wish that I was able by any means to secure such good results. I rise to protest against the dictum laid down by our mutual friend Deaver, that abdominal cases should be deprived of morphine. According to the doctor's own statement I am better authority on this subject than he, for notwithstanding the fact that his experience is much larger than mine, he admits that he does not know what a hypodermic syringe looks like. I do. I am somewhat like the old man who, when he came to die, told his son that he *knew* honesty was the best policy, because he had tried both ways. When I began abdominal surgery I followed that dictum laid down to us by our gynecological brethren, that we must not give opiates after operations, particularly in gynecological cases. I followed it conscientiously for years. I finally had an operation myself, though not upon the abdomen, and I insisted upon having morphine. After that I began to listen to the clamor of my patients. My results have been better since, and I believe that they are partially due to the use of opiates to relieve the extreme suffering. I should be sorry to have it go out, as the consensus of opinion of this great Association, that we are guilty of such cruelty to the human race.

Dr. Maurice H. Richardson, of Boston.

I should like to say a word about my own efforts and experience in peritonitis. It still remains the most important disease that I have to deal with. There is still a larger proportion of deaths in peritonitis than in any other disease; and this is true not only of my own cases, but of those of my colleagues.

The number of cases of accidental or preventable peritonitis, after operations for aseptic abdominal diseases, has become so small as to be

almost a negligible quantity. Even in operations which open septic areas like the intestine, the stomach, the gall- and urinary bladders, the occurrence of peritonitis is practically controlled. The mortality today in my cases is in those which come to me in an already advanced stage, or after operations in which extensive soiling of the intestines follows overwhelming escape of fluids virulently septic, as in operations upon the localized peritonitis of appendicitis or upon large acute tubal abscesses.

It is toward the successful control of sepsis in these last conditions, I take it, that our most strenuous efforts must tend. I do not observe as yet much, if any, improvement in the results of acute general peritonitis under full headway. In the control of beginning infection or of infections just getting headway, I have observed an encouraging improvement.

I use a method which is not in any way original and which is taught at the Massachusetts General Hospital. There has been a gradual evolution in the treatment of peritonitis from the beginning—when multiple incisions were made, with irrigation and extensive gauze wicking—to the present time, when a single incision is made, and very little disturbance of the abdominal viscera is the rule.

I used general abdominal irrigation, even in the beginning, in those cases only in which there was already a widespread infection, fearing, as I said many times, that I should enlarge rather than lessen the area infected. Later, I adopted in appendicitis—and applied it to all locally infected regions—the plan of walling off the field of operation with large masses of gauze which would absorb not only the existing fluids, but those escaping during the steps of the operation. For example, in acute gangrenous appendicitis with general infection, I fill the pelvis with gauzes and pack them upward until the liver is reached. The gauzes not only keep back the intestines from the appendix area, but they become heavy with absorbed fluids, so that when the operation is completed the pelvis, the right flank, and central abdomen are comparatively dry. I have never used the Fowler position. I cannot but feel convinced that the essential cause for my present good results in general peritoneal infections is early operation, with rigid confinement of fresh infection to the limited area of its original focus—whether appendix, tube, or gall-bladder—in the manner described, by which also the peritoneum is relieved of the greater portion of the infected exudate.

It seems to me that the one thing that makes these cases of peritonitis now successful is the education of the general practitioner to the importance of early diagnosis and operation.

There has been a wonderful progress in the treatment of peritonitis, from the time when the slightest soiling of the finger meant death to

the present time, when there is hope with even the most virulent and extensive infection. But even today, in that form of peritonitis which might be styled dry and adhesive, with very little exudate, in which the patient simply swells up and dies—in that form, chiefly postoperative, the outlook is just as bad as it ever was, whether you reopen the abdomen or not.

We may assume, of course, that there are many postoperative general infections in which the patient recovers without symptoms, and which we never suspect. When, however, I do diagnosticate a postoperative general peritonitis, it is practically always fatal.

I cannot criticise, except in the most favorable way, Dr. Murphy's method. I do not know that we use exactly that method, but we do not disturb things much; we do not wash out; we do not wipe extensively; we do not make multiple incisions; we depend much upon rectal lavage; we give nothing by mouth at first, and—rather than have our patients toss about all night—we let them have small doses of morphine.

Dr. John B. Roberts, of Philadelphia.

Dr. Murphy's brilliant paper has disproved effectually the oft-repeated statements of those operators who for years have contended that all cases of perforative appendicitis and similar lesions should be treated by an *insistent* search for the offending organ. It has shown effectively their error in believing that patients with peritonitis from perforation, or those in whom operative peritonitis is feared, should be tortured by persistent immobility in the dorsal recumbent position, by absolute deprivation of water, and by the ante- and postoperative withholding of even small doses of morphine and pain-obtunding drugs. Those of us who have contended for twenty years against such cruelty are now justified.

Dr. Richard H. Harte, of Philadelphia.

It would seem from what has been said that there are no hard-and-fast rules to be laid down in this treatment, but that every case is to be treated according to the conditions found.

Many men deceive themselves when using the tube in the rectal irrigation. They use a small tube raised three or four feet, and think they are carrying out Dr. Murphy's method of irrigation of the rectum. There is no graver error. In order to secure satisfactory results a large tube must be used in the rectum, with the reservoir at only a sufficient height to favor the flow of the fluid toward the bowel.

I have again and again seen patients who were supposed to be in the Fowler posture, though the three or four pillows at the back had slipped

down and allowed them to slide down in the bed. The only way to keep a patient in the Fowler position is to have a frame put on the bed which will support the weight of the patient by the buttocks and the thighs down as far as the knees.

In the typhoid perforation cases, in which perforation occurs at the end of a very long illness, the question often arises whether or not these patients are in a condition to be elevated. I have often seen such patients sitting up with the head hanging over to one side, as if they were too weak to hold it up, and I have heard medical men say that it was wrong to leave them in this position; yet I do believe they do better by sitting up. I have in my wards now three cases of this type, in which this method is being carried out, who are recovering.

Every case is a case unto itself. An instance is a case of peritonitis in which, within half an hour, perhaps, you may see certain factors for recovery, and yet, twenty-four hours afterward the same case may show that the tide for success is against it. Again, you open an abdomen and find it full of fluid, sometimes virulent, sometimes innocuous. You must consider in such a case whether perforation has lasted for a long or a short time.

In regard to washing and sponging there are also no hard-and-fast rules, but each case must be treated as found. You may open one abdomen and find it filled with feces requiring removal, while another, showing just a little bubble of gas at the point of perforation, will require no washing. Where a large mass of foreign material is found it must be gotten rid of, preferably by thorough douching.

Drainage tubes in these cases, I think, are often liable to do harm, and may cause perforation. I agree with Dr. Richardson that gauze offers better drainage than the tube. You can carry gauze all through the abdominal cavity, and at the end of six or eight hours you will find it saturated with serum or pus. You will increase the activity of the drainage by changing the external dressing and keeping it saturated with salt solution.

Dr. M. L. Harris, of Chicago.

I agree fully with all of the principles laid down by Dr. Murphy. I have tried them repeatedly, and I know that my patients got well. I do not wish to take from Dr. Murphy his answer to Dr. Oliver, except to reply to it by my own experience. I have had within the last few months 17 cases of bullet wounds of the abdomen, involving the intestine, in which there were from one to eight perforations. Every one of these cases were operated on within a few hours after the receipt of the injury. Of the 17 cases, 15 have recovered. In 1 of the 2 that died the bullet had also injured a large vessel at the posterior part of the

abdomen, so that the patient died on the table from hemorrhage before I could get into the abdomen and locate its source. The second died because the bullet had not only perforated the intestine, but the liver and right lung, the pleura, the transverse and the ascending colon, and produced a complete paraplegia with hemorrhage into the spinal canal. The last case I operated upon four weeks ago, and the man recovered. The bullet passed through the left kidney, the pancreas, the stomach, and right lobe of the liver. Every case was operated on early, and every single one was drained; to these two facts I attribute the successful results. I think the lesson to be drawn is that nearly all of these cases will recover if we have them operated on early.

Mr. B. G. A. Moynihan, of Leeds, England.

I had not the slightest intention of joining this discussion, for I am quite content to be a student and to pick up crumbs at this intellectual feast. I think, however, that I should not be doing justice to myself or to the people whom I have the honor to represent, if I did not just say this: That Dr. Murphy has rendered us a service that it would be difficult to overestimate. We are accustomed now to reckon our appendix cases in two groups: those which occurred before we, at the Leeds' Infirmary, had the pleasure of reading the paper of Dr. Le Conte, in the *Annals of Surgery*, in which we first learned of Dr. Murphy's treatment, and the cases which have occurred since that time. Before we read that paper we were accustomed to lose our cases. Now, when we operate upon our patients, we confidently expect—and our expectations are not often disappointed—to find them get better. We are accustomed to speak among ourselves of the "Murphy treatment." It is a byword in our hospital, and it is one of the very many occasions on which we take pleasure in paying a tribute to what Dr. Murphy has done in the surgery of the abdomen. I should like to say this in regard to the treatment of these cases: that only in very insignificant particulars do we vary from the method which Dr. Murphy has laid down. In the first place, we perform the operation as fast as ever we possibly can. We drain with what we call the split tube. A large-sized rubber tube is split along the wall of one side. When that tube is put in it is capable of draining along its whole length.

I take issue with Dr. Deaver in the question of the giving of morphine. A small hypodermic of morphine is given in every case, and given before the patient leaves the operating table. No house official is allowed to repeat that treatment without the instruction of the honorary officer.

We generally do not give these patients general anesthesia, but operate under stovaine, with lumbar anesthesia. An advantage of this anes-

thetic is, that as soon as the patient is under its influence he begins to pass abundant quantities of flatus. We thought at first that this was due to a lack of social restraint, but we know now that it is a thing for which we look confidently. We find that the emission of these enormous volumes of flatus makes the operation distinctly easier. When the patients are put back to bed they are placed in an exaggerated Fowler position. They are kept in that position by a hard bolster, put below the buttocks and underneath the thighs and attached by straps to the head of the bed, so that they cannot slide down, as Dr. Harte has mentioned. It is a simple device, and with it we have no difficulty.

In this, as in every other abdominal operation, we never put the smallest restraint upon the amount of fluid which the patient wishes to take. Our instructions to the nurse are to have a feeder full of water for the patient to use himself; and as often as the patient cares to empty it, it is their business to fill it. We do this on the principle that the filling up of the stomach and the small intestine helps the peristaltic action. We rarely have to give aperients after abdominal operations.

I am glad to have this opportunity to emphasize the enormous debt that we, in this matter, as in so many others, owe to the great work of Dr. Murphy.

Dr. Murphy. I wish to thank the gentlemen for their generous and free discussion. I wish to say, in bringing this matter before you, that I have no particularly important life-saving stitch to turn. It is the final result of a simple plan of treatment, and these results I wish to emphasize. In my reading of the paper this morning I omitted to mention the results of a number of cases. I wish to have it go out from this meeting, as my positive conviction, without the admission of question, that every case of general perforative peritonitis ought to get well if it is properly handled. That involves certain things; that involves timely action; that involves intelligent action; that involves following definite lines to results.

In answer to Dr. Ransohoff's question: Did I have any cases four or five days old? *No;* and I hope and trust I never will. All of the cases are under forty hours. All of the cases should be under twenty-four hours, and under twelve hours; and the sooner we, as surgeons, appreciate and emphasize, and talk and particularize, on the fact that these cases can and should be diagnosticated earlier, the sooner we will have the same type of results that we are getting from early operations for appendicitis. We can do it in this matter just as we have in appendicitis.

I made it very clear what these cases included and what I considered peritonitis. I cannot make the differentiation that Dr. Bevan makes between the type that has intestinal leakage and does not get peritoneal

inflammation, and the one that has intestinal leakage and does get peritoneal inflammation.

I wish to make clear another fact: That the presence of pus, general and free, the presence of a yellow, creamy fluid in the peritoneum, does not constitute peritonitis. I said that there had to be a perforation of the canal and a direct communication from the lumen of the canal into the free peritoneal cavity. The creamy pus that you so frequently see in the presence of peritonitis with circumscribed abscess, and in the presence of many other conditions of inflammation—that free, yellow, creamy fluid is very often a conservative fluid carrying millions of bodies to arrest and carry away the infective microörganisms.

The details of the technique I will not go into, except to say that we do not use anodynes. We do not use morphine.

The short duration of the anesthetic, as Dr. Bevan brought out, is important. The operation under gas, which Dr. Bevan and Dr. Harris do, I think is one very much to be desired. With the short anesthesia you get your patient up in a few hours, not as a limp rag, but clean-cut and wide awake.

This report includes 48 cases in all operated upon. It includes every case of general suppurative perforating peritonitis that came under my observation. They are not elected cases. They are cases that came to me all under forty hours. The 2 typhoid peritonitis cases without perforation were not included here. In the case of acute streptococcic peritonitis, the case had a leukocytosis running up from thirty odd thousand to eighty thousand. The infection came originally from an infection of the finger that was of streptococcic infection. In these cases I failed to mention that we had 7 secondary operations. These 7 secondary operations, aside from those for obstruction, were for circumscribed abscesses in various positions of the body, notwithstanding our drainage.

The one fact that I wish to emphasize is that, by following this simple treatment, we have succeeded in having 46 recoveries out of 48 cases.

LATE RESULTS AFTER OPERATIONS FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM.

By B. G. A. MOYNIHAN, M.S., F.R.C.S.,
LEEDS, ENGLAND.

It is with singular pleasure that I have the honor for the second time to accept your gracious invitation to deliver an address before the American Surgical Association. Five years have gone by since my last visit, and it is, I think, no exaggeration to say that within this period more fruitful and more beneficent work has been done and more knowledge has been gleaned in respect of the diagnosis and the treatment of diseases of the stomach than in any earlier period of equal length. In surgery, as in all the arts, progress is usually to be measured by the gradual transition from complex and intricate procedures to those of a simpler kind. The tendency in all that refers to the technical apparatus of surgery is always toward simplicity. In our search for the simple thing in the surgery of the stomach we have passed through many phases, and we have worked with a large variety of implements. Bone plates, bobbins, buttons, elastic ligatures, and strings have been milestones on our march. We have passed them all upon our way, and they are now and must forever remain behind us. They are each a witness to the constant striving for the plain and simple way, and each in turn has served a purpose, but there is no place for these things any more in the surgeon's work. The needle and the thread, simplest means of all, serve every purpose. So far also as most of the mechanical problems of gastric surgery are concerned, we have now arrived, I think, at a general agreement as to what is best; the differences of opinion that remain do not touch the larger issues,

but refer rather to the smaller details that affect but little, if at all, the ultimate results of our operative intervention. In the operation of gastro-enterostomy the modifications that have, from time to time, been introduced have led us, through devious paths, to a right appreciation of the essential points, and we have come to the almost universal recognition of the posterior no-loop procedure as the most satisfactory of all. The result of this operation in some cases was so remarkable, resulting as it did in a veritable resurrection of the patient, that it became exalted unduly as a therapeutic measure, it became a panacea for all the rebellious disorders of the stomach, and its exact place in surgery was not appreciated. We have, indeed, passed through a brief epoch of blind fetich worship to a calm and reasoned understanding of the precise value it has and of the definite limitations which should be set to its performance. And, accordingly, since in all the materials of our art so great a development has occurred, it is entirely right that we should now render an account of the work that has been done, that we should pass in review all that has been accomplished, and tell what we have learned, of the success we have had, and no less of the errors we have committed, so that, learning wisdom by experience, we may be the more strongly equipped to deal in the future with the very serious and the very frequent maladies by which the stomach is attacked. In endeavoring to arrive at a just estimate of the value of surgery in its application to the non-malignant diseases of the stomach I have gathered together the records of all the cases upon which I had operated up to the end of 1905. They are 281 in number; and may be classified into four groups:

1. Perforating ulcer of the stomach or duodenum.
2. Cases for which hemorrhage has been the immediate cause of urgent interference.
3. Cases of chronic ulcer, etc.
4. Cases of hour-glass stomach.

A printed form of detailed inquiry was sent out in the early part of this year to all the medical men who had very kindly referred these patients in the first instance to me. Of the 281 patients, recent information is at hand in reference to 265 cases. The work of

summary, analysis, and criticism has been very kindly undertaken for me by my colleague, Mr. Harold Collinson.

GROUP 1. *Perforation of the Stomach or Duodenum.* During the period mentioned, that is, to the end of 1905, I operated upon 27 cases of perforating ulcer; 18 patients recovered. In 6 cases gastro-enterostomy was performed immediately after the closure of the ulcer because of the narrowing at or near the outlet of the stomach, which this procedure had caused; one of these cases died and 5 recovered. In 2 patients symptoms due to a cicatricial stenosis near the pylorus developed within a few months, and gastro-enterostomy was necessary to afford relief. In one patient I have recently had to operate four years after the closure of a perforating ulcer, which had caused a contraction in the centre of the stomach. Gastro-enterostomy was performed to the greatly hypertrophied cardiac pouch of an hour-glass stomach. In 8 cases, therefore, in a total of 18 who recovered, the operation of gastro-enterostomy has been necessary. All these cases are now reported to be quite well. In the remaining 10 cases the ulcer was placed on the lesser curvature and in the cardiac half of the stomach in 9 instances; in 1 it was "prepyloric;" 8 of the 9 patients are now quite well and make no complaint of stomach symptoms; from one patient nothing has been heard. The patient whose ulcer was prepyloric complains of indigestion and occasional vomiting, and will probably need gastro-enterostomy.

The present condition of these patients is interesting in reference to two points. In the first place it is suggestive of the need for gastro-enterostomy in all cases of a perforating ulcer placed at or near the pylorus, in a position where the subsequent contraction in healing is likely to cause stenosis. In the second place it makes it evident that when an ulcer is placed near the lesser curvature and away from the pylorus, its excision or infolding suffices to give complete relief. Gastro-enterostomy in such circumstances is, therefore, not necessary at the time the perforation is treated, nor is it likely to become necessary at a later stage.

GROUP 2. *Acute Hemorrhage.* In the series of hemorrhage cases there were 27 patients submitted to operation, of whom 23

recovered and are alive now; reports as to their present state of health have been received from 22. One patient, who was admitted to the hospital from prison, cannot now be traced; 18 are reported as being "perfectly well," "cured," absolutely cured;" in each one a complete restoration to health, good digestion, and normal appetite has occurred. One case is improved in health, but is rather delicate. His medical man reports: "The operation was for urgent and grave hematemesis, and, undoubtedly, saved the patient's life, but he is still, as he was before, weak and frail. There are no symptoms of dyspepsia." Three patients have suffered from postoperative vomiting. Two of the cases operated upon in January and March, 1903, had the posterior long-loop operation; in one, vomiting of bile occurred infrequently for a year and then disappeared; the patient is now "quite well;" in another it has continued at intervals of two or three weeks up to the present time; the patient, however, says that she is "far better" than before and "able to work now." In the third case the no-loop operation was performed, the jejunal direction being downward and to the right. This case is to me the most interesting of all, for it is the only case in which, after the no-loop operation, any bilious vomiting has occurred. The operation was in February, 1905, upon a patient seen with Dr. Nicholson Dobie and the late Dr. Dreschfeld.. Bilious vomiting occurred every week or two up to three months ago, when it disappeared after repeated lavage. In this case, after the anastomosis was completed it was noticed that the jejunum did not fit well; it seemed to be twisted above the point of union with the stomach; a remark to this effect is made in the notes written by my assistant on the day of the operation.

GROUP 3. *Cases of Chronic Gastric and Duodenal Ulcer, etc.* The patients in this case number 205; among them were 2 fatal cases and 214 operations.

For the purpose of analysis I have adopted the following classification:

	Cases.	Deaths.
A. Gastric ulcer, duodenal ulcer, singly or together	174	2
B. Cholelithiasis with ulcer	4	0
C. Cholelithiasis causing obstruction	6	0
D. No demonstrable ulcer	11	0
E. Pyloroplasty	3	0
F. Secondary operations, the primary performed elsewhere	7	0
G. Secondary operations in cases in classes A and E	9	0
Total	214	2

Class A. There are 174 cases: 74 males and 100 females.

	Males.	Females.
Gastric ulcer alone	39	83
Duodenal ulcer alone	21	8
Gastric and duodenal ulcers	14	9

In this group a demonstrable ulcer was found in every instance. The number of duodenal ulcers was relatively very small in the earlier cases, but has gradually increased. Latterly I have operated more frequently for duodenal than for gastric ulcer, and I think it not improbable that many cases in which the lesion was formerly supposed to be in the pylorus were incorrectly classified.

Class B. Four patients in whom ulcer was associated with cholelithiasis; three ulcers were gastric and one duodenal, and in all posterior gastro-enterostomy was performed.

In three cases cholecystotomy was performed at the same time.

In one case an operation has been performed twelve months previously for cholecystitis and stone in the cystic duct. Subsequently cholecystectomy was performed and a calculus removed from the common duct.

All the patients recovered and are cured.

Class C. In 6 cases cholelithiasis or its results were found to be interfering with the proper action of the stomach. Five patients were females; one, a male. Of these 6 cases, 2 had had cholecystotomy performed before, and adhesions had caused pyloric narrowing. In one of these a gastro-enterostomy had also been done with the aid of Murphy's button. The stomach symptoms returned after a year, and on re-opening the abdomen it was found that the

anastomosis was almost closed. A second gastro-enterostomy by suture was, therefore, performed.

In the remaining 4 cases, posterior gastro-enterostomy and cholecystotomy were performed three times, and cholecystectomy and gastro-enterostomy once. All the patients recovered and are cured. In all these cases the adhesions which existed between the stomach or duodenum and the bile passage made it impossible to say whether ulceration in these viscera existed. In all probability ulceration was present, or has been present, in every case.

Class D. In 11 cases, 10 primary and 1 secondary, no demonstrable ulcer was found; all the patients were females. In 2 of these hematemesis has occurred; and in several the stomach is described as being "dilated." In one case death occurred two days after operation from uremia, and ulceration without induration was found in the duodenum, probably uremic in origin and of very recent occurrence.

In 3 cases the patients are now quite well. In 6 cases the patients are no better, and in 1, improvement is "doubtful."

Class E. In 3 cases pyloroplasty was performed. In all, gastro-enterostomy had subsequently to be performed five months, four years, and seven years afterward.

Class F. There were seven secondary operations, the primary being performed elsewhere. The following table gives the details:

Previous operation.	Abnormal condition found.	Secondary operation.	Result.
Gastro-enterostomy with Murphy button.	Opening closed.	Posterior gastro-enterostomy.	Cured.
Posterior gastro-enterostomy.	A long loop.	Roux's operation.	Cured.
Posterior gastro-enterostomy.	A long loop and a small opening.	Roux's operation and gastro-enteroplasty.	Improved.
Anterior gastro-enterostomy.	Adhesions causing obstruction below the anastomosis.	Lateral entero-anastomosis.	Cured.
Posterior gastro-enterostomy.	Nothing abnormal, no lesion of any kind.	Exploratory.	No benefit.
Posterior gastro-enterostomy.	Adhesions constricting distal limb.	Enteroplasty.	Improved.
Gastrolysis.	Many adhesions and ulcer in duodenum.	Posterior gastro-enterostomy.	Cured.

Class G. There were nine cases of secondary operations, the primary having been performed by me. The following table shows the details:

First operation.	Abnormal condition.	Second operation.
Posterior gastroenterostomy with Laplace's forceps.	Opening closed, return of symptoms.	Posterior gastroenterostomy with Murphy button.
Posterior gastroenterostomy	Long loop; regurgitation.	Entero-anastomosis.
Posterior gastroenterostomy	Hernia into lesser sac.	Reduced. Lateral anastomosis.
Posterior gastroenterostomy	Long loop; regurgitation.	Entero-anastomosis.
Posterior gastroenterostomy	Long loop; regurgitation.	Roux's operation.
Posterior gastroenterostomy	Return of symptoms; opening too small.	Gastroenteroplasty.
Pyloroplasty, three cases.	Pyloric stenosis.	Posterior gastroenterostomy

In addition, two of my cases were subsequently operated upon by other surgeons. In one case a hernia into the lesser sac was found and reduced; in another some adhesions were found and were separated.

Postoperative vomiting occurred in 22 cases in this series: 19 were primary operations and 3 secondary.

Class A. Postoperative hematemesis occurred in two cases, in one a pint of blood was vomited within twenty-four hours of operation; no ill result followed. In a second, hematemesis occurred after the patient's return home on several occasions; this was a secondary operation, and no lesion was visible when I explored.

Class B. Regurgitant vomiting of bile necessitating early operation. One case, profuse vomiting for three days; quite relieved by entero-anastomosis.

Class C. Later regurgitation due to a loop and relieved by secondary operation. Two cases treated by entero-anastomosis.

Class D. Cases in which vomiting occurred early and has now ceased. Seven cases treated for a time by lavage with complete relief.

Class E. Cases in which vomiting still occurs. Eight cases were operated upon before 1905, and in all a long loop of the jejunum was left.

Class F. Vomiting of food occurs now. Two cases; in both the symptom was frequent before operation and has not been relieved.

Ulcers were found on the lesser curvature in 8 cases; gastro-enterostomy was performed in 7 and excision in one. In 3 cases carcinoma occurred later in the site of what was supposed to be a chronic ulcer, and in all proved fatal. In one, only slight improvement has followed the operation; in the remaining cases the patients are now quite well.

Late Results. In 14 cases no report was furnished in 1908, but in 11 of these the patients were seen by me over two years after operation, and I have notes to say that all were well; in 3 cases no report can be obtained.

In 12 cases the patients are reported to be "no better" or "about the same." In 6 of these cases, all women, no ulcer was found at the operation, nor any evidence of obstruction. One of the cases was a secondary operation by myself, the primary operation having been performed elsewhere. I found no lesion of the stomach, and closed the abdomen without doing anything further. There has been no relief from the symptoms, pain, and hematemesis. In another case the lesion was very slight, a small scar only being found on the posterior surface. One case is an example of Finney's operation. Three suffer from vomiting, but are kept fairly comfortable and free from symptoms by lavage.

In five there has been complete relief from the symptoms for which the operation was done, but in all there is slight, very occasional, vomiting, chiefly of bile. The intervals of this vary from "two to three weeks" to "every few months." In all the patients have returned to work, eat well, have gained weight, and attribute the onset of the vomiting to slight or grave indiscretions in the matter of diet. In four of the cases the patients are "well satisfied" with the result of the operation, though their surgeon does not share their feeling of content.

In ten cases the improvement is doubtful or has been tardy. Three of these were secondary operations, the original operation being done elsewhere. One patient was well for two years, then began to lose weight and to become progressively more and more

anemic. He died four months later of "pernicious anemia." In one case of duodenal ulcer, with the most intense hyperchlorhydria, there was a recurrence of symptoms one year later, and at a second operation elsewhere some adhesions and a jejunal ulcer (?) were found. The patient recovered and improved subsequently. The remaining patients have still some of their former symptoms, and usually have to make occasional calls upon their medical man. The chief symptom that remains is vomiting. In all the ulcer found was small and at some distance from the pylorus, in the body of the stomach or on the lesser curvature.

Eight patients have died since operation of diseases apart from the stomach:

One six and one-half years later, of carcinoma of the pancreas; 1 six years later, after operation by another surgeon for carcinoma of the cecum; 1 eight months later, of acute pneumonia; 1 four years later, of cardiac disease; 1 three months later, of acute abscess of lung; 1 one year later, of cardiac disease; 1 two years later, of pernicious anemia; in 1 case the cause of death three years later is not mentioned.

In seven cases death occurred from malignant disease of the stomach occurring at the site of the ulcer. The deaths occurred two years, four years, two and one-half years, three and one-quarter years, one year, one and one-half years, two and one-half years, subsequently. The deaths in these cases are very significant. The intervals in most of them, between operation and death, suggests that the condition present at the time of the operation was not then malignant, but rather that a carcinomatous invasion of the diseased part occurred at a later period. They were, perhaps, examples of ulcus carcinomatosum. There can be no doubt that in some of these cases Rodman's operation, excision of the ulcer-bearing area, would have been the better procedure.

Two patients died as the direct result of the operation; one from uremia, one from acute obstruction due to hernia of all the small intestine into the lesser sac, and strangulation at the margin of the opening through the transverse mesocolon.

The final results in this group may be briefly stated thus:

Living.

Cured	148
Relieved	5
Doubtful	9
No better	12
No recent report	14

(Eleven of these may be considered certainly as cured.)

Dead.

As result of operation	2
Of carcinoma of stomach	7
Of other causes	8
Total	205

GROUP 4. *Summary and Analysis of Cases of Hour-glass Stomach.* There were 22 cases, made up of 7 males and 15 females. In every case there had been previous symptoms pointing to chronic gastric ulcer. In 4 cases the history is strongly suggestive of a former "subacute" perforation, while in a third case the urgency of a perforation indicated operative measures.

The total mortality is three: 1 on the fourth day, from septicemia, resulting from a strangulated rectal prolapse; 1 in the third week, from suppression of urine; 1 on the fifth day, from pneumonia.

The ulcer in the stomach was associated with duodenal ulcer in 2 cases (1 male and 1 female).

In 1 case a pancreatic cyst was also found at operation. Adhesions to the anterior abdominal wall were met with in 4 cases. Trilobed stomach was seen once.

The following operations were performed: Gastro-enterostomy alone, seven times; 1 death. Gastrogastrostomy and gastro-enterostomy, three times. Gastroplasty alone, seven times; in 2 secondary operations were necessary. Dilatation of stricture, once. Gastroplasty and gastro-enterostomy, twice; 1 death. Gastrogastrostomy alone, once. Gastro-enterostomy and Loreta's operation, once; the patient died.

RESULTS. Twenty-two cases, 3 deaths; 3 secondary operations (gastro-enterostomy) for return of symptoms; 1 secondary opera-

tion, entero-anastomosis, for regurgitant vomiting after gastro-enterostomy.

One patient has since died of puerperal fever. Recent reports have been received from 17, all of whom are quite well; of 1 no report has been heard.

A summary of the number of cases in all the groups gives the following results:

	No.	Recov.	Died.	Since died.	Cured.
Group 1	27	18	9	0	16
Group 2	27	23	4	0	19
Group 3	205	203	2	15	159
Group 4	22	19	3	1	17
Total	281	263	18	16	211

The present condition of all the patients now alive is as follows:

	Cases.
Cured	211
Improved	9
No better	12
Doubtful	9
Not recently reported	6
Total	247

Thirty-four patients are dead; 18 as a result of the operation, 7 of carcinoma of the stomach, 9 from other causes unconnected with the disease of the stomach or the operation performed for its relief.

Such is a brief review of the after-history in all my cases. What are the lessons to be learned therefrom? I submit the following points:

1. The operative treatment of stomach disorders should be confined exclusively to those cases in which an organic lesion is present. Unless there is a palpable and demonstrable ulcer in the stomach or in the duodenum, or some condition which hampers the proper action of the stomach, the symptoms are not due to any pathological cause capable of being relieved by surgical interference. However careful our preliminary investigations may be, we shall, from time to time, display upon the operating table a perfectly

normal stomach. We must not then endeavor to cover our diagnostic disaster by the performance of an unnecessary operation upon the stomach, but rather must we candidly confess that our exploration has proved negative. To perform gastro-enterostomy in such cases has, I think, been proved to lead to unsatisfactory results, whereby the operation is discredited.

2. In cases of acute perforating ulcer the perforation should be closed or the ulcer excised. When the ulcer lies upon the lesser curvature nothing more is necessary than this. The after-history of such cases shows that they are relieved from all disabilities referable to the stomach. When the ulcer is prepyloric, pyloric or duodenal gastro-enterostomy also should be performed. It doubtless hastens the immediate recovery of the patient by affording an easier exit from the stomach than that impeded by the ulcer, and it forestalls the almost certain onset of symptoms which only a short circulating operation can relieve.

3. When a non-malignant lesion is discovered, the treatment appropriate to it depends upon its position in the stomach. If an ulcer be placed on the lesser curvature at some distance from the pylorus, in such a position that no obstruction is offered to the onward passage of the food, excision should be performed. In such cases the relief from gastro-enterostomy may be incomplete, and it is probable that the later onset of malignant disease occurs in a large proportion of cases. In some cases, however, when the ulcer is on the curvature or on the posterior surface of the stomach adherent to the pancreas, relief follows if gastro-enterostomy is performed on the cardiac side of the lesion. It may be that the ulcer when anchored impedes the proper movements of the stomach, or that, the nerve supply being interfered with, some local paresis of the gastric wall results.

4. If the ulcer be prepyloric, pyloric or duodenal gastro-enterostomy should be performed. It is desirable also to infold an ulcer whenever possible, for both hemorrhage and perforation have occurred from ulcers for which gastro-enterostomy has been performed months or years before. The local treatment of the ulcer is always desirable, and is generally easily performed.

5. The most satisfactory method of gastro-enterostomy is the posterior no-loop operation, with the almost vertical application of the bowel to the stomach. The vertical position is that into which the jejunum falls most easily in the normal (that is the erect) position of the body. A deviation to one or other side if slight is of no importance, and entails no untoward consequences.

6. Regurgitant vomiting occurs as a result of the "loop" operation, whether anterior or posterior. It is relieved almost certainly by an entero-anastomosis. Patients who suffer from it may be relieved entirely of all symptoms for which they originally sought relief. An operation that is mechanically imperfect relieves the original disorder, though it leaves serious disabilities behind it. The vomiting of bile may be relieved by lavage, and in some patients disappears entirely after the lapse of weeks or months or even years.

7. In cases of hour-glass stomach the surgical treatment necessary presents special difficulties on account of the frequency of a duel lesion, one in the body of the stomach, one at the pylorus; and double operations have consequently to be frequently performed.

A STUDY OF GASTRIC AND DUODENAL ULCERS, WITH ESPECIAL REFERENCE TO THEIR SURGICAL CURE.

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THIS paper is limited in its scope to a discussion of gastric and duodenal ulcers, with a view to presenting some facts as to their surgical cure. There seems to be much apprehension in the minds of the profession at large as to just what cases should be subjected to surgical treatment, and at what stage operation is to be recommended, if at all. In the following series the average duration of the pre-operative symptoms was over twelve years, and no patient was operated upon for ulcer until medical treatment had been tried over and over again without securing a permanent cure.

There is no conflict between medicine and surgery in this field, as only the cases that fail to yield to a *reasonable* amount of medical treatment should be considered surgically.

The physician is quite within reason in asking the surgeon as to the ultimate results of the operative treatment of gastric and duodenal ulcer. It is not enough that we show the mortality immediately following operation to be low, and the patient temporarily relieved, but two years of time at least should elapse after operation before the patient can be safely pronounced cured. The answer to the question is, however, not an easy one, as a number of factors must be taken into account.

In the earlier work some of the patients were not relieved because of technical errors which have now been corrected, and especially because gastrojejunostomy was for a time looked upon as a "cure all" and applied indiscriminately without regard to local con-

ditions. In other instances of apparent failure the diagnosis was questionable, as the evidence that the disease was ulcer depended upon pre-operative clinical data, rather than pathological findings at the operating table.

It can be said too that gastric and duodenal ulcers cannot be separated from their complications, so that no review would be complete on the surgical side without including obstructions, deformities, and limiting adhesions that interfere with the gastric function even after the ulcer itself has healed.

It seems wise, therefore, to present at this time all the cases of ulcer and kindred diseases of the stomach and duodenum operated upon by Dr. C. H. Mayo and myself since the first case in 1893, a period of fifteen years, but to confine the special investigation and statistics to the ulcer group.

Total number of operations to May 1, 1908, 827; total number of patients operated upon, 768; 225 cases were operated upon for benign lesions other than ulcer, and are classified in the following groups:

1. Adhesions and bands the result of ulcer.

2. Secondary infectious processes, such as subdiaphragmatic abscess, etc., the result of perforating ulcer.

3. Cases apparently of inflammatory origin, but in which evidence that the process was ulcer proved insufficient to classify them as such.

4. Pyloric obstruction from contracture of the pyloric muscle and valve formation, etc., apparently not due to ulcer.

5. Bullet and stab wounds, other traumatisms, and foreign bodies.

6. Benign tumors, hypertrophic plyoric stenosis, syphilis, and tuberculosis.

7. In which the stomach was opened to obtain access to the cardiac orifice for cardiospasm and benign strictures of the esophagus—gastrostomy, etc.

8. In which the duodenum was opened to obtain access to stones and tumors in the posterior wall of duodenum, papilla, and ampulla of Vater.

9. Obstructions and ulcerations of the stomach and duodenum caused by gallstones.

10. Negative explorations of interior of stomach and duodenum.

This leaves 540 cases operated upon for ulcer of the stomach and duodenum.

Acute Perforations. There were 27 patients operated upon for acute perforations. In 5, primary gastrojejunostomy was also done, with 2 deaths. In 22, closure of the perforation was made, with abdominal drainage, and but one of the 18 who recovered required a secondary gastrojejunostomy, the perforation having seemingly put an end to the disease.

Acting upon this observation, I have twice, in chronic gastric ulcer, where the conditions were such that I could not excise, and where gastrojejunostomy was not indicated, exposed the crater of the ulcer, which in each case was found comparatively small, but surrounded by a mass of indurated and scar tissue. With a sharp knife I cut out the base of the ulcer, thus producing the picture of acute perforation, then closed the defect. Just what the ultimate outcome will be I do not know, but the immediate results have been most favorable.

Development of the Surgical Treatment of Chronic Ulcers. Our experience with the surgical treatment of chronic, gastric, and duodenal ulcers can be divided into three stages: (1) The period previous to 1900. (2) The period from 1900 up to and including 1905. (3) From 1905 to the present time.

First Period. The surgery of chronic, gastric, and duodenal ulcers previous to 1900 might be called the surgery of benign obstructions, as the majority of operations were for gross lesions. The relief afforded by these operations was immediate and permanent in all but a few cases where technical failure to secure good gastric drainage was at fault. The operative mortality was about 6 per cent.

Two varieties of operations were employed, gastrojejunostomy and pyloroplasty. Unfortunately, one-third of our cases subjected to the pyloroplasty of Heinecke-Mikulicz required secondary operation. Gastrojejunostomy we then, as now, generally employed, but

made it anteriorly with the Murphy button. The character of the complications subsequent to this operation varied from the occasional dropping into the stomach of the button to the contraction of the opening due to the traction weight of the attached intestine at the point of anastomosis. Volvulus of the loop and incarceration of the small intestine through the loop, each, however, accounted for the necessity of a secondary operation.

At the meeting of the American Surgical Association, 1902, I reported seven of these mishaps, but in spite of technical errors, operations during this early period were very successful. The Murphy button demonstrated the great possibilities of gastro-intestinal surgery, and the occasional failure of the button stimulated efforts toward betterment of methods.

We learned by experience that within reasonable limits the greater the obstruction the more certain the cure, and we also learned the value of having the opening in the stomach at the lowest point (*Annals of Surgery*, 1902), for we noticed that after the button was placed, all of those cases in which the traction weight on the anterior gastric wall caused a funnel to form gave successful results, and, as will be shown later, the majority have remained well up to the present time—from eight to fifteen years.

Second Period. Stimulated by these early successes, the next six years were marked by the invasion of new fields; we were no longer contented to wait for starvation through obstruction to force operation, but rather attempted to forestall this final stage and by earlier operation terminate the disability, relieving the patient from the underfeeding and pain which are such marked symptoms of the malady.

The results in this group did not compare favorably with the early period, in which the problem was purely one of mechanics arising from interference with gastric drainage, or with the third period, in which technical errors had been largely eliminated and a sound pathological basis substituted for fallacious clinical observations.

The problem was approached with the knowledge gained from the operative treatment of obstruction, but when this was put

into actual practice where there was no obstruction, it was very quickly found that the stomach was not a bag emptying itself by gravity, but a muscular organ which always propelled the food toward the pylorus, and that if the pyloric end of the stomach and the upper duodenum were not interfered with mechanically or otherwise by the presence of an ulcer, the food would not pass out of the gastrojejunostomy opening, but in spite of it would continue through the pylorus. While this position was disputed at the time by eminent authorities, I believe that it is now generally accepted. In some cases, where the ulcer was situated at a considerable distance above the pylorus, a certain amount of benefit did occur, however, by reason of the passive drainage of the irritating gastric secretions through the artificial stoma during the period in which the stomach was fasting and inactive.

It was eventually discovered that ulcers which exist to the left of the pyloric end of the stomach should, if possible, be excised, but if in doing this deformity was created which would interfere with the progress of food, gastrojejunostomy should, in addition, be performed.

The excision of gastric ulcers was still further stimulated in that a considerable percentage of ulcers later degenerated into cancer. In 180 cases of our own, in which part of the stomach was resected, cancer on ulcer base was demonstrated in 54 per cent. Ulcer of the duodenum seldom undergoes malignant metamorphosis, so that this indication for excision does not apply with the same force to duodenal ulcers.

During this second period great efforts were made to improve the technique of gastrojejunostomy. Where pyloric obstruction was present almost any method gave good results, but if no obstruction existed some of the biliary and pancreatic secretions were liable to enter the stomach, and this annoying complication occasionally led to the necessity for an entero-anastomosis to check the disturbance.

Roux, Doyan, and others invented primary operations, combining entero-anastomosis in some form with gastrojejunostomy, while Eiselsberg proposed to artificially obstruct the pylorus,

thinking to produce the favorable conditions known to be present in obstructions.

The posterior operation gradually replaced the anterior as the popular method. The loop was eliminated, and we no longer turned the jejunum to the right, but sutured it to the stomach, as it runs normally downward and to the left.

We have made over 300 gastrojejunostomies for ulcers of the stomach and duodenum by this particular method, with a mortality of less than 1 per cent., and but three cases have required a secondary operation upon the stomach for any cause.

In all "loop" operations, anterior or posterior, the intestine is applied to the stomach downward and to the right, but in the "no-loop" method we found that this sometimes caused angulation, as it turned the jejunum at the duodenojejunal angle rather sharply from its normal position, and occasionally caused chronic bile regurgitation.

The vertical attachment of the jejunum to the stomach, as originally practised by Mikulicz with a transverse intestinal incision, and by Czerny with the Murphy button, has been recently revived by Mr. Moynihan, who is now using it with the longitudinal intestinal incision (*Annals of Surgery*, April, 1908).

Technical errors were, however, not the sole cause of failure to cure. The whole subject was pathologically undeveloped; we did not always know at the operating table whether ulcer was present or not, and we failed to differentiate ulcer from non-operative diseases of the stomach, and occasionally operated upon cases who would have been better treated otherwise. In the beginning we really had little exact knowledge of the living pathology of ulcer excepting its complications—obstruction, perforation, and hemorrhage. The clinical symptomatology was based upon an erroneous pathology, teaching that chronic ulcer frequently confined itself to the mucous coat, consequently gastrojejunostomy was often done when no ulcer could be found, under the mistaken idea that an ulcer actually existed, but was hidden in the interior of the stomach, and a number of patients whom the operation had failed to relieve because they did not have gastric or duodenal ulcer were recorded

by both physician and surgeon as instances of operative failure to cure, instead of a *mistake both in diagnosis and operation*, which was the fact.

In 14 cases of our own and a number in which the primary operation was done by other surgeons, we have re-operated for trouble of this description, and usually failed to find any trace of an ulcer; we have, therefore, in such cases, cut off the gastrojejunostomy and closed both sides, restoring the gastro-intestinal canal to its normal continuity. Strange to say, that following this temporary gastrojejunostomy nearly half of the patients were relieved of their original discomfort, but sufficient time has not elapsed for us to know whether this will be permanent.

The Finney operation gave remarkably good ultimate results in pyloric obstructions, but in cases of unhealed ulcers existing proximal to or distal from the parts involved in this operation less benefit was derived unless the ulcer lay within the zone of the operative field, so that it could be coincidently excised.

The mortality of this second period was not greatly reduced, remaining at about 5 per cent., largely because a number of these patients had complicated operations, and in some instances several operations, which increased the mortality; but in spite of these developmental errors, the large majority of true ulcers were relieved or cured, as will be demonstrated later.

Third Period. The third period covers about two and one-half years. The doubtful cases have been eliminated, and a living pathology established which enables the surgeon to recognize the ulcer at the operating table. If the ulcer is not actually demonstrated, no gastric operation is undertaken unless necessitated by hemorrhage.

Gastrojejunostomy is still our most valuable operation, especially for duodenal ulcer, which is the lesion in nearly two-thirds of our cases (Fig. 1).

The operation of Finney is chosen for pyloric strictures (Figs. 2 and 3).

Ulcers in the stomach at a distance from the pylorus are excised (Figs. 4 and 5).

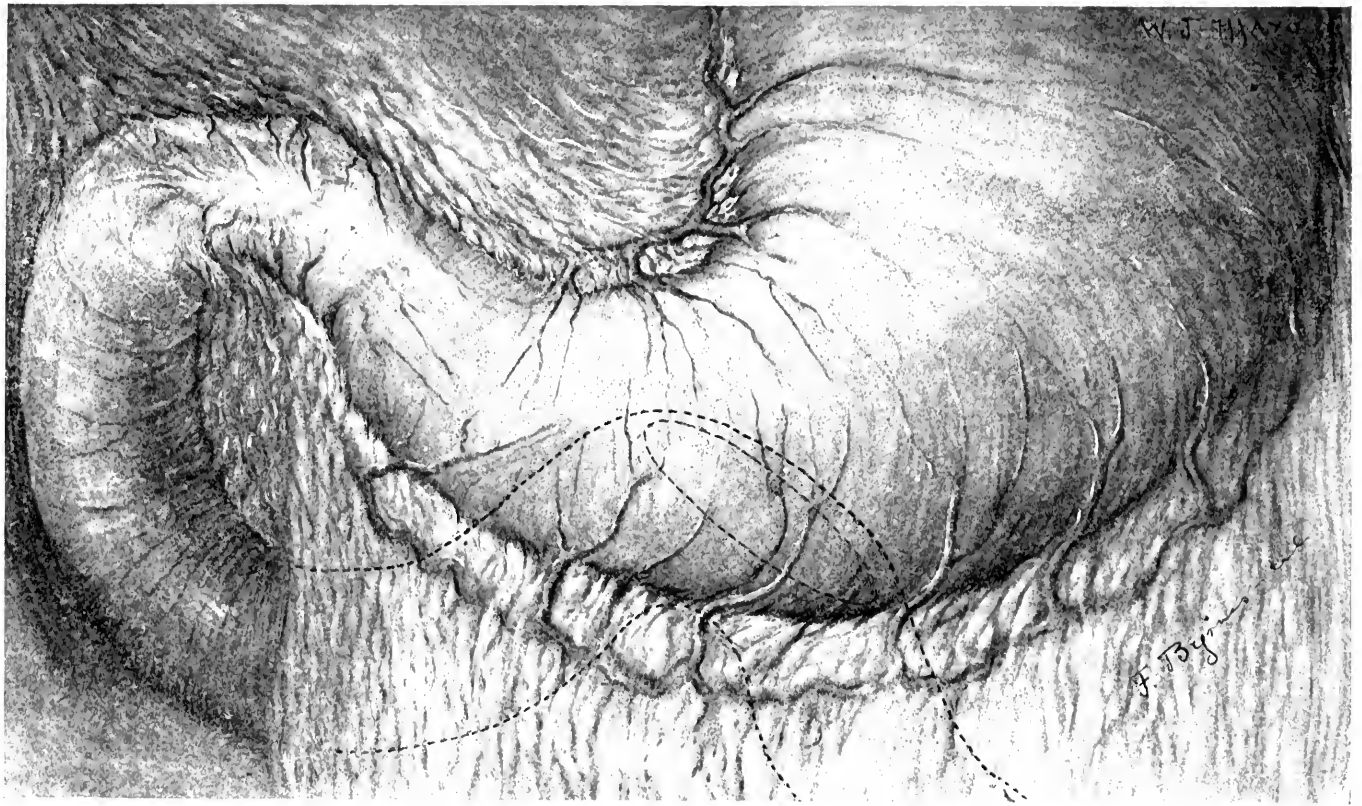

FIG. 1. Ulcer of the doudenum and gastrojejunostomy after the posterior "no-loop" method.

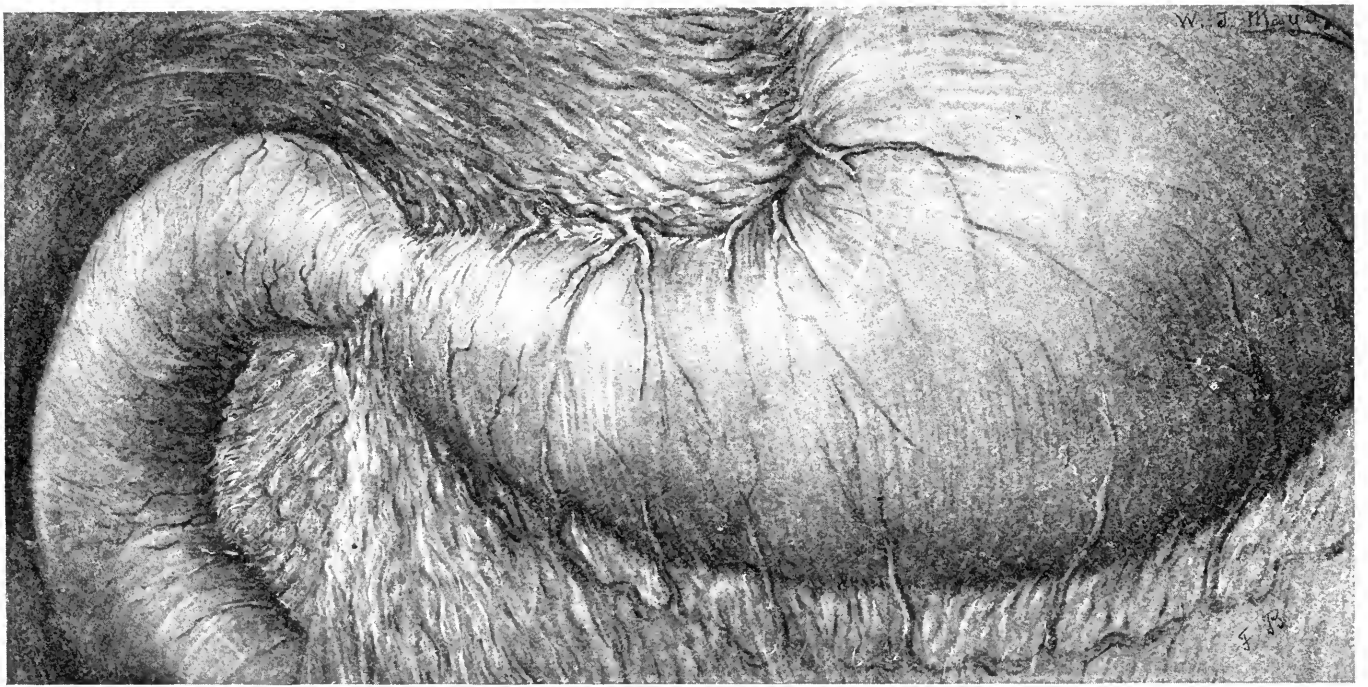

FIG. 2.—Pyloric stricture. Finney's gastroduodenostomy indicated.

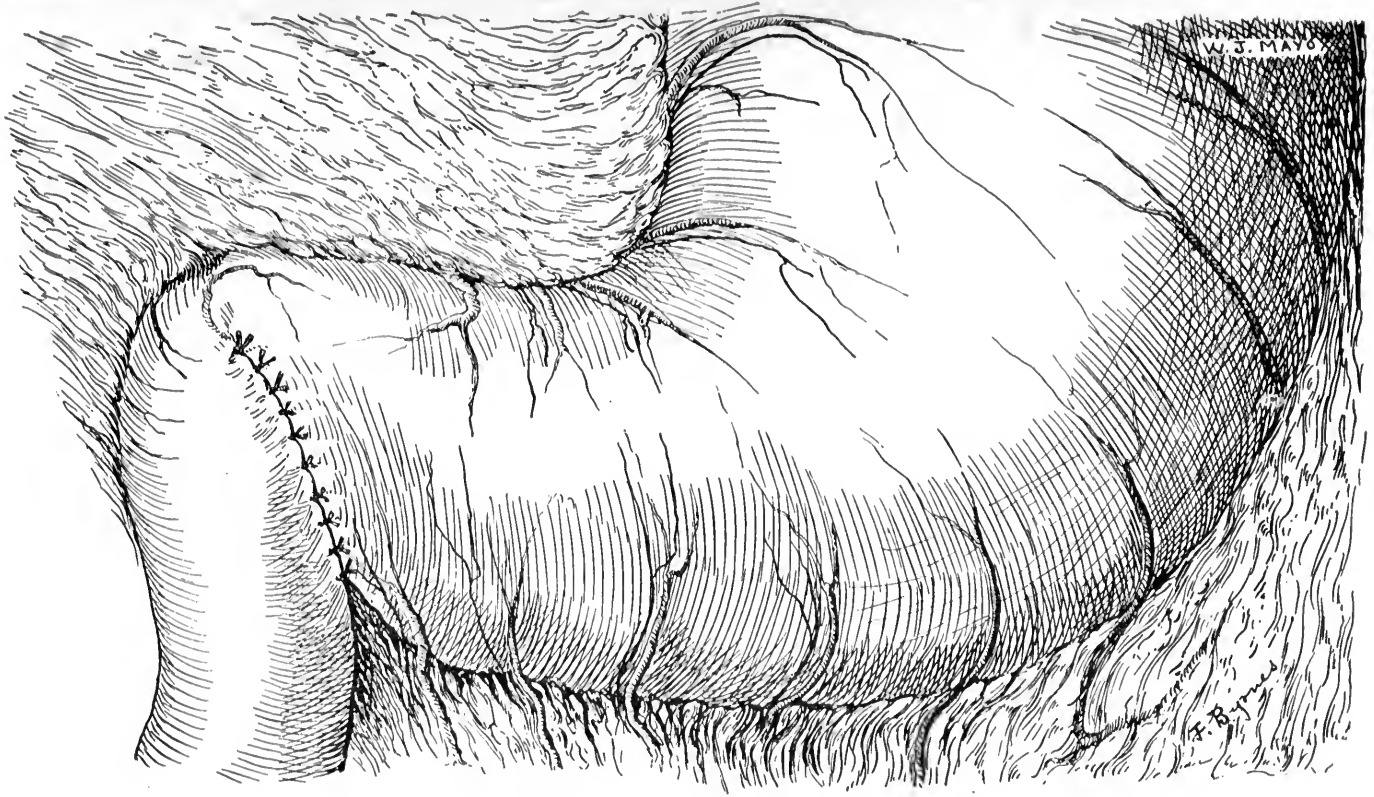

FIG. 3.—Result of Finney operation. (See Fig. 2.)

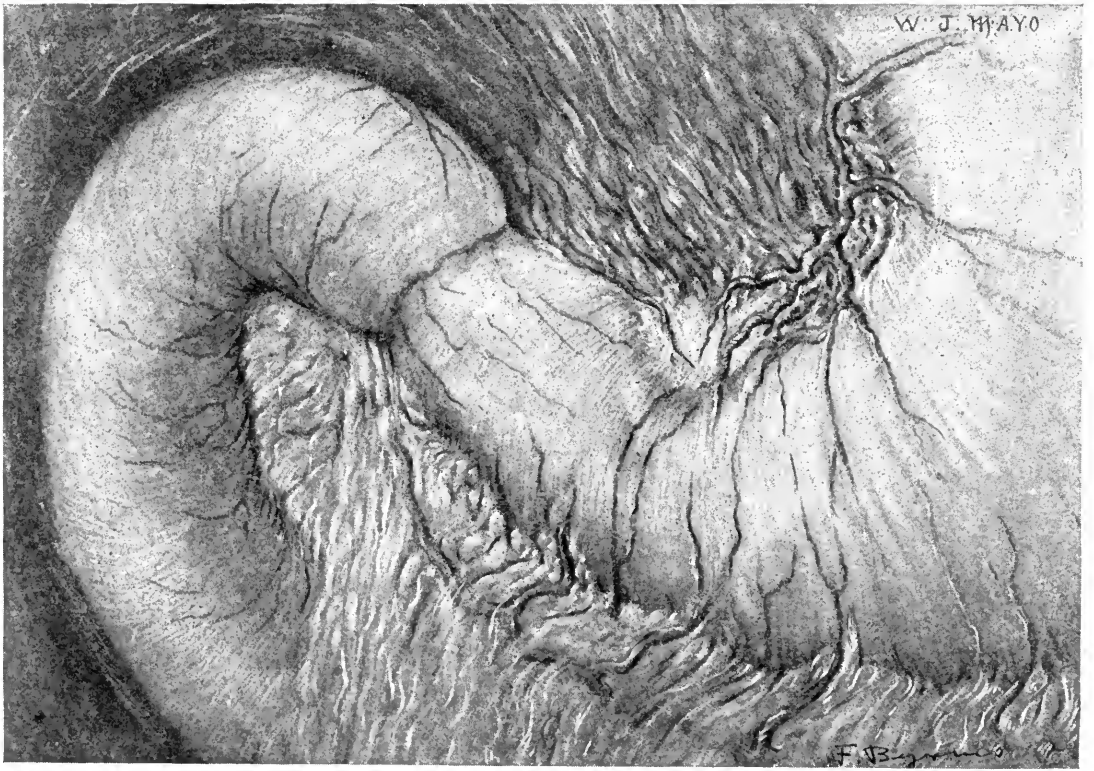

FIG. 4.—Saddle ulcer of the lesser curvature without causing serious obstruction and indicating excision. (See Fig. 5.)

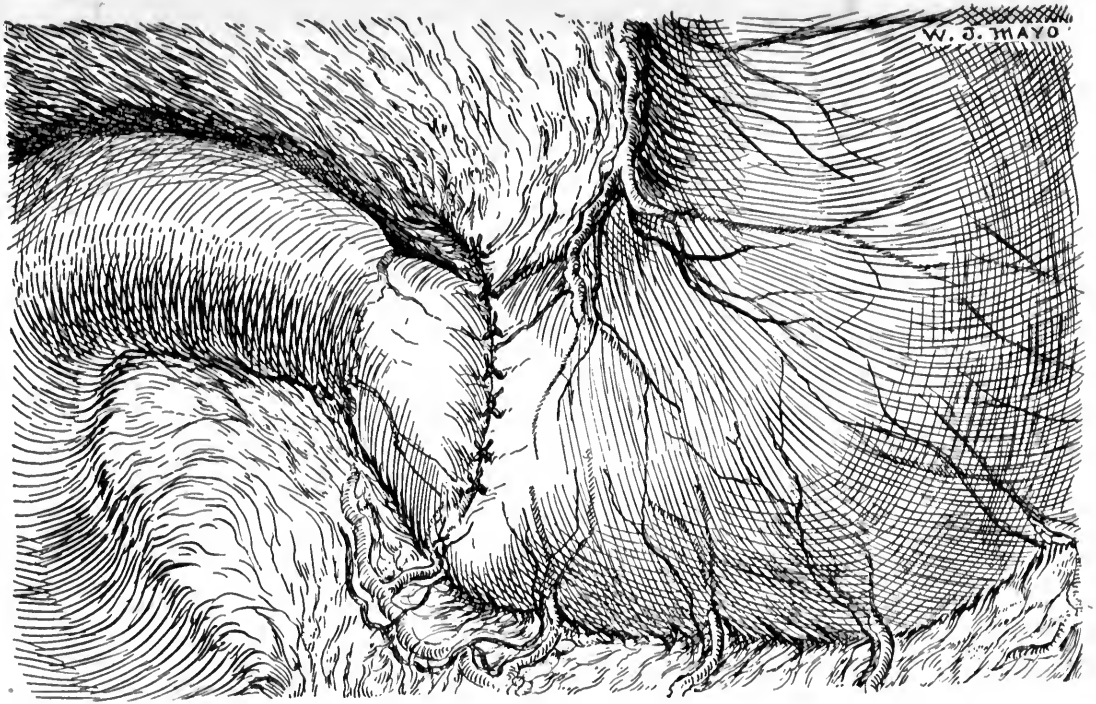

FIG. 5.—Result of excision of saddle ulcer. (See Fig. 4.)

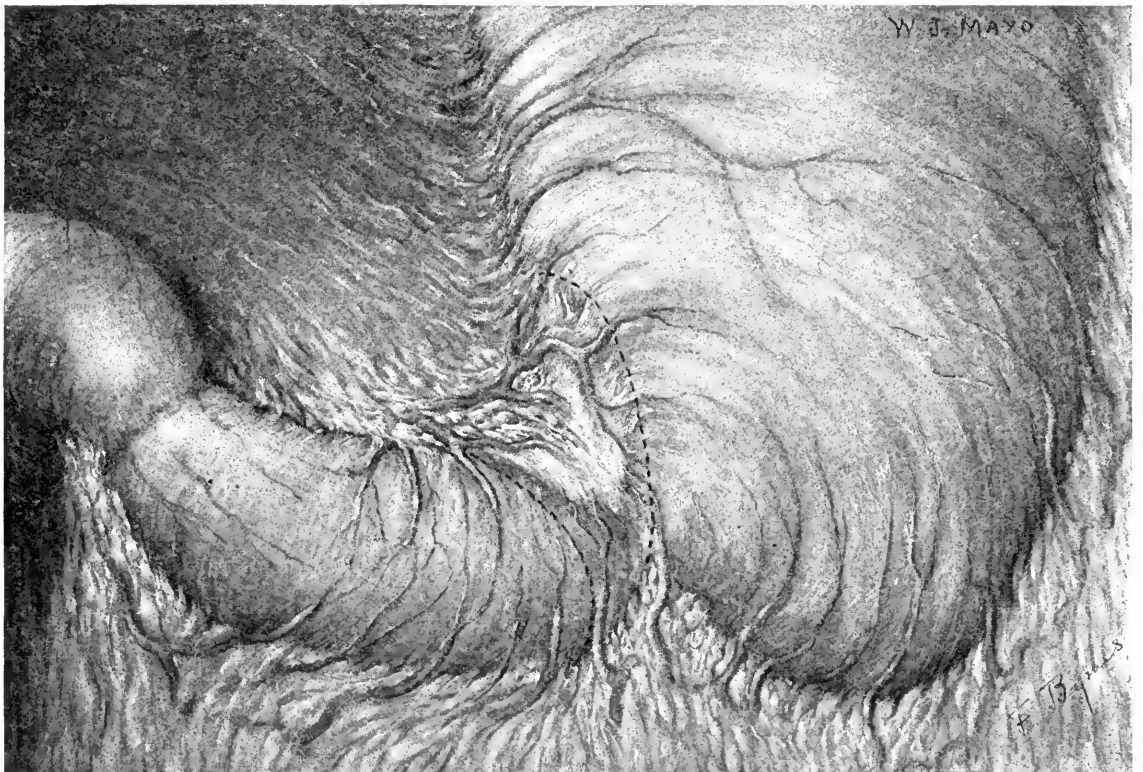

FIG. 6.—Hour-glass stomach. Dotted lines show proposed resection. (See Fig. 7.)

FIG. 7.—Result of resection of the obstructing ulcer in the hour-glass stomach. (See Fig. 6.)

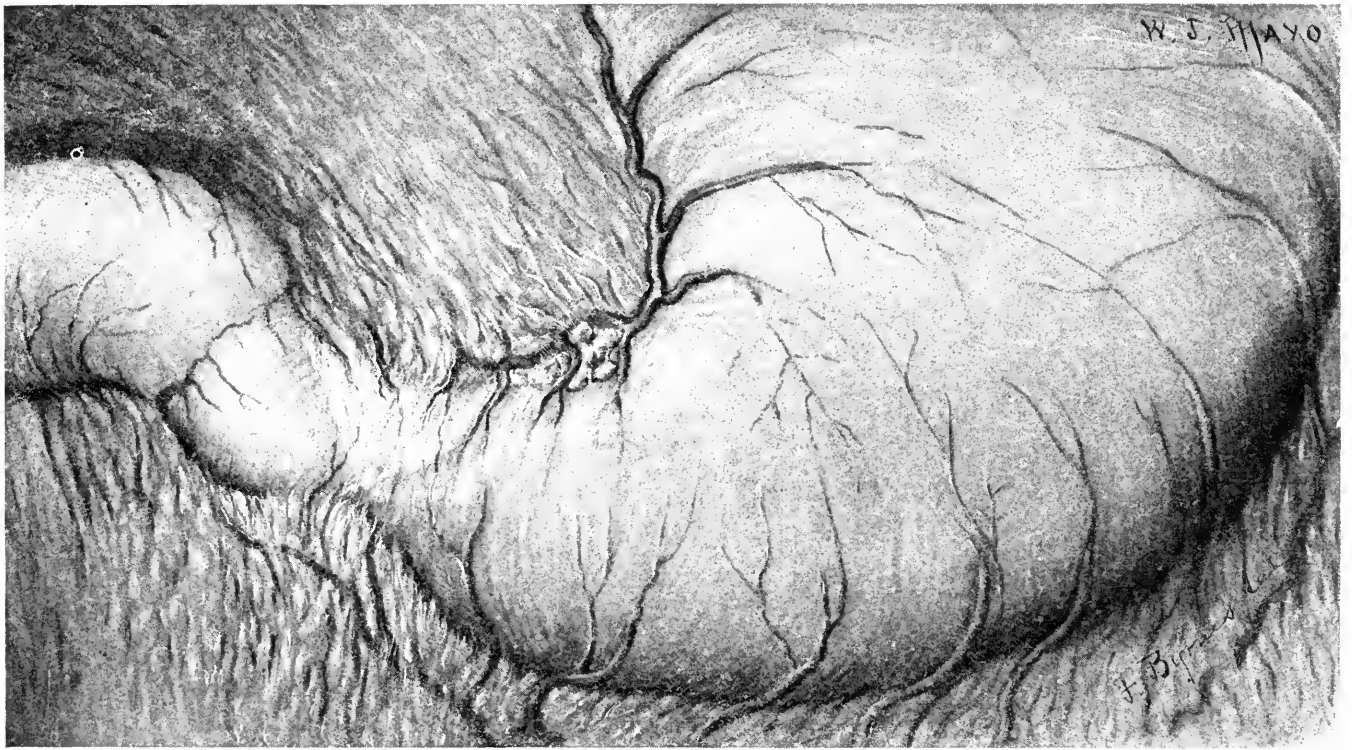

FIG. 8.—Calloused ulcer at pyloric end of stomach, indicating resection. (See Fig. 9.)

FIG. 9.—Result of Rodman's excision of pyloric end of stomach for calloused ulcer with gastrojejunostomy. (See Fig. 8.)

If hour-glass contraction is present, the whole diseased area is excised (Figs 4 and 7). If it is not possible to do this, proximal gastrojejunostomy is performed.

Calloused ulcer of the pyloric end of the stomach indicates the operation of Rodman (Figs. 8 and 9), consisting of resection of the diseased area with closure of the duodenum and independent gastrojejunostomy. (Modified Billroth No. II for cancer.)

The mortality of even the more complicated operations does not exceed 3 per cent., while the cures will, I believe, run 95 per cent. or over.

Surgical Cures of Gastric and Duodenal Ulcers. Three hundred and seventy-nine cases of gastric and duodenal ulcer were operated upon by us previous to June 1, 1906, consisting of 211 males and 168 females, with an operative mortality of 4.8 per cent.

In 64 of these no ulcer was actually demonstrated at the time of operation, the record stating that they were clinical, medical, or mucous ulcers, as they were then called.

In some, slight points of apparent thickening were found, or spots where the mucous membrane did not "seem to glide on the muscular tunic as it should," and this was accepted as evidence, but in our later work actual search of the mucosa for such supposed lesions did not often show their existence.

This brings up the important question: Can *chronic* ulcer exist without visible and pronounced evidence in the walls of the stomach and duodenum? We must admit that this is a rare possibility. We have operated upon a few cases in which we were unable to detect an ulcer even after careful intragastric investigation, when the history seemed to demonstrate that an ulcer was present.

Eleven, or 17 per cent., of the 64 patients required supplementary operations at a later date. In 9 no ulcer was discovered at the second operation, but in 2 an ulcer was found which had been previously overlooked. It seems fair, therefore, to put all of these 64 cases, excepting the two just mentioned, in which the ulcer was shown at the second operation, in a separate classification as questionable. All of these were operated upon in the second period between 1900 and 1906. Since that time no questionable cases have been submitted to operation.

Of this questionable group, we have obtained knowledge of 50. Seventeen, or 34 per cent., were cured; 14, or 28 per cent., improved; 16, or 32 per cent., unimproved; and 3, or 6 per cent., are dead, showing cured and improved, 62 per cent.

In the 318 cases of actually demonstrated ulcer, we have traced 234. Of these, 189, or 80.7 per cent., are cured; 21, or 9 per cent., improved; 10, or 4.2 per cent., unimproved; and 14, or 6 per cent., have died since the operation from various causes; in only 2 cases, however, was the cause of death connected with the stomach, showing a total percentage of 89.7 cured and improved.

In conclusion, let me say that ulcer patients need careful regulation of diet, etc., following operation, and should be under medical supervision until they have made a complete recovery.

END-RESULTS FOLLOWING OPERATION FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM.

By JOHN B. DEAVER, M.D.,
OF PHILADELPHIA.

My being able to report the results contained in this paper has been made possible only by the careful and painstaking work of Dr. A. D. Whiting, Assistant Surgeon to the German Hospital, who collected and tabulated the data, and to whom I cheerfully give the credit.

Empiricism, or the reliance on direct experience and observation rather than on theory, must be condemned, as a rule, in the scientific surgery of today. There should undoubtedly be a reason for every step taken in surgery; there should be a theory back of every application of practical means used to afford relief from any pathological condition found in the human body. The practical mind, however, is ever too prone to seek results rather than to explain how or why such results are obtained. Practical experience must influence us to work more or less empirically, although it must be admitted that there is always a tendency to adopt a theory which is more or less in keeping with the results obtained—a theory that may be laid aside in a day, a month, a year. This tendency toward empiricism has been especially marked in the operative treatment of some of the benign diseases of the stomach and duodenum. Practical results are obtained, but why they are obtained in some conditions must be left for the future to definitely decide. Hence it is that a study of end-results following operative interference in these diseases will give a better idea of the condition in which a stomach operation is indicated than would a study of

the theoretical etiology of the conditions present, or a study of the theory underlying the results obtained.

Stomach surgery is in its infancy. It has grown old enough, however, and has shown sufficient accomplishments to make most investigators agree that certain pathological conditions to be found in that organ and the duodenum must be overcome by the surgeon rather than by the internist. The immediate results speak volumes; the end-results are far superior to any that can be obtained by other than operative means.

The principal benign diseases of the stomach and duodenum which are found in the realm of surgery today are ulcer, with its various complications; gastrectasis, whether due to pylorospasm, gastric myasthenia, or pyloric stenosis; and stenosis of the pylorus, either with or without dilatation.

End-results following operation for gastric ulcer do not always justify the picture so graphically portrayed by Kocher, but he undoubtedly is correct in the vast majority of cases when he says that "not only can the numerous dangers of ulcerating affections of the stomach, such as hemorrhage, perforation, transition into cancer, be prevented, but the disease and its results may be so rapidly and certainly cured that the medical treatment of obscure cases must be put in the background. The pain in the stomach disappears immediately after the operation. This is the invariable rule. The patient does not require to pay any further attention to the nature of his food. The vomiting disappears, the bowels become regular, there is progressive improvement in the process of digestion."

In gastric dilatation, gastric myasthenia, and ptosis of the stomach probably the most that surgery can do is to so alter the mechanism of the stomach and intestine that medical measures will become effective.

When there is pyloric obstruction, no matter what the cause, there is a definite procedure indicated—namely, the establishment of a free and permanent communication between the stomach and intestine.

In these various diseases, practical experience has taught that

the best results may be obtained by performing a gastro-enterostomy. The choice of operation varies with different operators. Personally, I prefer the posterior gastrojejunostomy, when it is practicable, the no-loop clamp method with excision of a portion of the mucous membrane. This procedure practically eliminates the danger of the so-called "vicious circle," and the use of the clamps minimizes the danger of leakage and infection during the operation. The end-results are just as good when the suture method is used with no loop, instead of the clamps, but the primary danger is greater than in the former method. The no-loop operation is a great advance over the long loop, not only because the immediate results are better, but also because there is much less or practically no danger of a vicious circle being established even subsequently, as not infrequently was the case even when a primary entero-enterostomy was performed.

Patient No. 2610, 1905, is a good example of this condition. Patient was a female, aged forty years. She had been operated upon in 1900, the name of the operator not being ascertained, for ulcer of the stomach, a posterior gastrojejunostomy, long loop, being performed with a Murphy button. For one year she was in good health, with no stomach symptoms. During the year she gained thirty-five pounds. She then began vomiting intermittently, which continued with more or less regularity for three years. She was admitted to the German Hospital November 28, 1905, with persistent uncontrollable vomiting of stomach contents and bile. Operation, November 29, 1905. Ether anesthesia. The gastrojejunostomy opening was patulous. The pylorus was partially occluded by an old scar. An entero-enterostomy with suture was performed, and the pylorus was ligated with silk. She made an uninterrupted recovery. February 11, 1908, two years and three months after the operation, she is in fairly good health, much better than before the operation, although she still complains of some stomach trouble. The no-loop operation practically eliminates all such cases from the surgeon's notice.

The operation of election should always be performed when possible; the best possible procedure under the conditions present

must be adopted when the operation of election is not feasible. A poorer and much less satisfactory method, the anterior gastrojejunostomy, should not be excluded entirely from the surgeon's list of procedures, as has been advocated by one of the best-known operators in the country.

Patient No. 478, 1902, a male, aged forty years, furnishes a good example of what can be accomplished even by this procedure. He was transferred from the medical to the surgical wards of the German Hospital with a history of long-standing stomach disease, with pyloric obstruction. A mass in the pyloric region was easily palpable. Operation, March 10, 1902. Ether anesthesia. Upon opening the abdomen a mass the size of a lemon was found occupying the site of the pylorus and causing almost complete occlusion. Extensive adhesions made it practically impossible to deliver the stomach sufficiently to allow of a posterior operation. An interior gastrojejunostomy was performed in the belief that the patient would be benefited by it. He made a rapid and uneventful recovery, most of his symptoms disappearing immediately. Five years and eleven months after the operation he is in good health, being absolutely free from all gastric symptoms. He has gained thirty-six pounds.

End-results will probably always be better when it is possible to perform the operation of election or choice; but relief in all instances must be afforded the patient, if it be at all possible, whether the method used be one of choice or one of necessity.

An analysis of the end-results in operation for benign diseases of the stomach and duodenum is of great interest to the medical profession of today, but it will be of greater value and interest to the operator of the future when the more improved methods of operation shall have had an opportunity to show their worth with increasing age. I have been able to trace 66 of the patients upon whom I have performed stomach operations for benign disease. Of this number, 44 are free from all gastric symptoms, 9 are greatly improved, 5 are unimproved, and 8 have died. These figures give a percentage of cures of 66.6; of patients that were greatly improved, 80.3. From the operative viewpoint these patients were divided as follows:

Posterior gastrojejunostomy, long loop, suture: 7 cases traced, 6 of whom had no gastric symptoms five years seven months, five years three months, four years four months, two years one month, and one year four months, respectively, after operation. One case died four years and four months after operation from unknown cause. Percentage of cures, 85.7.

Posterior gastrojejunostomy, long loop, suture, primary entero-enterostomy with Murphy button: 12 cases traced, 7 of whom had no gastric symptoms four years five months, four years four months, three years four months, two years eleven months, two years (moved to Ireland), two years six months, three years two months, respectively, after operation. One was improved two years ten months after operation. Two were unimproved three years and two years eight months, respectively, after operation. Two cases died, both two months after operation. Percentage of cures was 58.3; of those improved, 66.6.

Posterior gastrojejunostomy, long loop, suture, secondary entero-enterostomy, Murphy button: 3 cases traced, 1 of whom had no gastric symptoms four years six months after operation. Two cases died, one two years and two months after operation, cause unknown; the other died one year after operation from obstruction of the bowel due to bands. Percentage of cures was 33·33·

Posterior gastrojejunostomy, long loop, suture, primary entero-enterostomy with secondary ligation of the pylorus: 1 case traced, no gastric symptoms two years two months after operation.

Posterior gastrojejunostomy, long loop, suture, secondary gastroduodenostomy and entro-enterostomy: 1 case traced, no gastric symptoms one year six months after operation.

Posterior gastrojejunostomy, no loop, suture: 25 cases traced, of whom 16 had no gastric symptoms two years seven months, two years four months, two years, two years, two years, one year eleven months, one year nine months, one year eight months, one year eight months, one year seven months, one year seven months, one year seven months, one year five months, one year four months, one year one month, one year one month, respectively, after opera-

tion. Four cases were improved one year seven months, one year five months, one year three months, one year two months, respectively, after operation. Three cases were unimproved two years two months, one year six months, one year three months, respectively, after operation. One case died one year after operation, cause of death unknown. Percentage of cures, 64; of improvements, 84.

Posterior gastrojejunostomy, no loop, clamps: 6 cases traced, of whom 5 had no gastric symptoms one year, eleven months, eleven months, ten months, six months, respectively, after operation. One case died seven months after operation, there having been no improvement in the gastric condition.

Anterior gastrojejunostomy, suture: one case traced, no gastric symptoms five years eleven months after operation.

Duodenorrhaphy, posterior gastrojejunostomy, long loop, suture, primary entero-enterostomy: 1 case traced, no gastric symptoms three years seven months after operation.

Duodenorrhaphy, posterior gastrojejunostomy, no loop, clamps: 1 case traced, no symptoms nine months after operation.

Gastrogastrostomy, posterior gastrojejunostomy, short loop, suture: 1 case traced, improved two years three months after operation.

Gastrogastrostomy, posterior gastrojejunostomy, no loop, clamps: 1 case traced, improved ten months after operation.

Entero-enterostomy, ligation of pylorus: 1 case traced, improved two years three months after operation.

Partial gastrectomy, posterior gastrojejunostomy, no loop, clamps: 1 case traced, no symptoms eight months after operation.

Pylorectomy, posterior gastrojejunostomy: 1 case traced, no symptoms four years eight months after operation.

Pyloroplasty: 1 case traced, no symptoms four years seven months after operation.

Pylorectomy, posterior gastrojejunostomy, long loop, suture, primary entero-enterostomy: 1 case traced, died five months after operation from general anasarca.

Gastrorrhaphy, posterior gastrojejunostomy, long loop, suture,

primary entero-enterostomy: 1 case traced, no symptoms four years seven months after operation.

An analysis of the various diseases of the stomach and duodenum for which operations were performed gives a good idea of the beneficial results obtained. The results presented at this time and those that will be brought before the medical world in five or ten years will vary considerably on account of the great advancement that is being constantly made in the technique of the various forms of operation advocated. The patients of the future will have the benefit of the work that has been accomplished in the past, all of which will be greatly to their advantage. It will also be established, probably, that a certain operative procedure is more fitted to the cure of one disease than to another, that each disease will be treated as an entity, with a special form of operation, whether it be a pyloroplasty, a posterior gastrojejunostomy, an excision, a pylorectomy, a partial gastrectomy, or what not.

The cases traced were diagnosticated as follows: Ulcer of the stomach, 37 cases, of whom 23 were cured, 6 improved, 4 unimproved, and 4 died, or 62.1 per cent. cures. Ulcer of the duodenum, 12 cases, of which 2 had perforation. Of these 12 cases, 11 were cured and 1 improved, or 91.6 per cent. cures. Stenosis of pylorus, 8 cases, of which 5 were cured, or 63.5 per cent. cures. Gastrectasis, 6 cases, of which 4 were cured, or 66.6 per cent. of cures. Vicious circle and peripyloric adhesions, 1 case each, of which number neither was cured, although both were greatly improved. Neoplasm of the pylorus, 1 case, cured. Total, 66 cases traced, of which number, 44, or 66.6 per cent., were cured.

The list of diseases, the operation performed, and the end-results are as follows:

Ulcer of stomach, posterior gastrojejunostomy, long loop, suture: 4 cases traced, of whom 3 had no symptoms four years four months, one year four months (when he was killed in a mine), and one year nine months, respectively. The fourth case died about four years after operation, cause of death not known.

Ulcer of stomach, posterior gastrojejunostomy, primary entero-enterostomy, Murphy button: 10 cases traced, of whom 6 had

no stomach symptoms four years four months, three years two months (died: nephritis), two years eleven months, two years (moved to Ireland), two years four months, respectively. One case was improved two years ten months after operation. One case was unimproved two years eight months after operation. Two cases died two months after operation, there having been no improvement in symptoms.

Ulcer of stomach, posterior gastrojejunostomy, long loop, suture, secondary entero-enterostomy, Murphy button: 1 case traced, no symptoms four years six months after operation.

Ulcer of stomach, posterior gastrojejunostomy, no loop, suture: 15 cases traced, of whom 8 had no symptoms two years two months, two years, two years, one year nine months, one year eight months, one year five months, one year four months, respectively, after operation. Three cases were improved, two years, one year five months, one year two months; 3 were unimproved, two years two months, one year six months, one year three months, and one case died (cause of death unknown) one year, respectively, after operation.

Ulcer of stomach, pylorectomy, posterior gastrojejunostomy, long loop, suture: 1 case traced, no symptoms four years eight months after operation.

Ulcer of stomach, posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button with secondary ligation of pylorus: 1 case traced, no symptoms two years two months after operation.

Ulcer of stomach, posterior gastrojejunostomy, secondary gastro-duodenostomy with entro-enterostomy, Murphy button: 1 case traced, greatly improved one year six months after operation.

Ulcer of stomach with hour-glass contraction: 2 cases traced. In both cases a gastrogastrostomy with posterior gastrojejunostomy, no loop, was performed. Both cases were markedly improved, one two years three months, and the other ten months after operation.

Ulcer of stomach, perforated, gastrorrhaphy, posterior gastro-jejunostomy, long loop, suture, primary entero-enterostomy,

Murphy button: 1 case traced, no symptoms three years three months after operation.

Ulcer of stomach, posterior gastrojejunostomy, no loop, clamps: 1 case traced, no symptoms one year after operation.

Ulcer of duodenum, posterior gastrojejunostomy, long loop, suture: 2 cases traced, both well five years seven months, and two years one month, respectively, after operation.

Ulcer of duodenum, posterior gastrojejunostomy, no loop, suture: 5 cases traced, of which number, 4 had no symptoms two years seven months, one year eleven months, one year seven months, one year one month, respectively, after operation. One case was improved one year three months after operation.

Ulcer of duodenum, posterior gastrojejunostomy, no loop, clamps: 3 cases traced, no symptoms eleven months, ten months, and six months, respectively, after operation.

Ulcer of duodenum, perforated, duodenorrhaphy, posterior gastrojejunostomy, long loop, suture, primary entero-enterostomy, Murphy button: 1 case traced, well three years seven months after operation.

Ulcer of duodenum, perforated, duodenorrhaphy, posterior gastrojejunostomy, no loop, clamps: 1 case traced, no symptoms nine months after operation.

Stenosis of pylorus, pyloroplasty: 1 case traced, no symptoms four years seven months after operation.

Stenosis of pylorus, posterior gastrojejunostomy, long loop, suture, entero-enterostomy: 2 cases traced, 1 having no symptoms four years five months, the other being unimproved three years after operation.

Stenosis of pylorus, posterior gastrojejunostomy, no loop, suture: 2 cases traced, both having no symptoms two years four months, and one year seven months, respectively, after operation.

Stenosis of pylorus, posterior gastrojejunostomy, long loop, suture, secondary entero-enterostomy, Murphy button: 1 case traced, died two years two months after operation, cause of death unknown.

Stenosis of pylorus, pylorectomy, posterior gastrojejunostomy, long loop, suture, primary entero-enterostomy, Murphy button:

1 case traced, died five months after operation from nephritis. All stomach symptoms had disappeared.

Stenosis of pylorus, partial gastrectomy, posterior gastrojejunostomy, no loop, clamps: 1 case traced, no symptoms eight months after operation.

Gastrectasis with ptosis, posterior gastrojejunostomy, long loop, suture: 1 case traced, no symptoms five years five months after operation.

Gastrectasis, posterior gastrojejunostomy, secondary entero-enterostomy, Murphy button: 1 case traced, died one year after operation from intestinal obstruction due to bands.

Gastrectasis, posterior gastrojejunostomy, no loop, suture: 2 cases traced, no symptoms one year seven months, and one year two months, after operation.

Gastrectasis, posterior gastrojejunostomy, no loop, clamps: 2 cases traced, 1 having no symptoms eleven months after operation, the other having died seven months after operation, no improvement in symptoms.

Vicious circle, entero-enterostomy, ligation of pylorus: 1 case traced, improved two years three months after operation.

Peripyloric adhesions, posterior gastrojejunostomy, no loop, suture: 1 case traced, improved one year seven months after operation.

Neoplasm of pylorus, anterior gastrojejunostomy, suture: 1 case traced, no symptoms five years eleven months after operation.

From the foregoing analyses I would draw the following conclusions, these naturally being influenced by the immediate dangers from the various forms of operation:

1. The operation of choice should always be performed when feasible; when not feasible, the operation of necessity should be performed.

2. All cases of stenosis of the pylorus, whether due to a neoplasm, cicatricial contraction, hyperplasia, pylorospasm, or what not, should be treated by operative interference, preferably by posterior gastrojejunostomy.

3. All cases of ulcer of the stomach which do not respond to

medical treatment promptly, and the various sequelæ of this disease, should be treated by operation.

4. All cases of ulcer of the duodenum, which do not respond promptly to medical treatment, should be treated by operation.

5. My preference in performing gastro-enterostomy is by the posterior gastrojejunostomy, no loop, clamp route.

For list of the cases traced, see accompanying tables.

ABSTRACTS OF CASE HISTORIES.

I. Patient 478, 1902.—Transferred from medical to surgical ward with history of long-standing stomach trouble due to pyloric obstruction. Operation, March 10, 1902. Ether anesthesia. Stomach slightly enlarged. Mass size of lemon occupying seat of pylorus. Adhesions of long standing prevented posterior gastrojejunostomy. Anterior gastrojejunostomy performed, with sutures. Recovery. February 5, 1908. No symptoms. Is in very good health. Gained thirty-six pounds.

II. Patient 1405, 1902.—Female, aged thirty-eight years. For fifteen years had had indigestion, pains in epigastric region, nausea. No mass palpable. Operation, July 27, 1902. Ulcer of duodenum with cicatricial stenosis of pylorus. Posterior gastrojejunostomy, long loop, suture. February 9, 1908. No symptoms except constipation. In good health. Has gained in weight.

III. Patient 1953, 1902.—Female, aged twenty-seven years. For six months had pain after eating, with vomiting half hour after meals. Pains marked in epigastrium. Eructations of gas. No blood in vomitus. Operation, October 11, 1902. Ether anesthesia. Ulcer of stomach, with adhesions between stomach and liver; pylorus thickened and indurated. Posterior gastrojejunostomy, long loop, suture. Patient died four years after operation, cause of death unknown.

IV. Patient 2257, 1902.—Male, aged twenty-nine years. Very irregular in regard to meals. For six years has had epigastric pains, generally worse at night, oftentimes when asleep. Would awaken to find stomach greatly distended and painful. Eructations of gas gave relief. For last six weeks has had vomiting

TABULATED STATEMENT SHOWING END-RESULTS FOLLOWING OPERATIONS FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM.

Date.	Case No.	Diagnosis.	Operation.	End-results.
1902	478	Pyloric neoplasm, general adhesions.	Anterior gastrojejunostomy, suture.	Well, 5 yrs. 11 mos.
1902	1405	Ulcer of duodenum, stenosis of pylorus.	Posterior gastrojejunostomy, long loop, suture.	Well, 5 yrs. 7 mo.
1902	1953	Ulcer of stomach, stenosis of pylorus. Adhesions.	"	Died, 4 yrs. cause?
1902	2257	Gastrectasis.	"	Well, 5 yrs. 5 mos.
1903	1291	Stenosis of pylorus. Cholecystitis.	Pyloroplasty. Cholecystostomy.	Well, 4 yrs. 7 mos.
1903	1385	Ulcer of stomach, stenosis of pylorus.	Pylorectomy, posterior gastrojejunostomy, long loop, suture.	Well, 4 yrs. 8 mos.
1903	1482	Stenosis of pylorus.	Posterior gastrojejunostomy, long loop, suture, secondary entero-enterostomy, Murphy button.	Died, 2 yrs. 2 mo.?
1903	1604	Ulcer of stomach, stenosis of pylorus.	"	Well, 4 yrs. 6 mos.
1903	1750	Stenosis of pylorus.	Posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button.	Well, 4 yrs. 5 mos.
1903	2166	Ulcer of stomach, cicatrix of pylorus.	"	Well, 4 yrs. 4 mos.
1903	2245	Ulcer of stomach, pyloric adhesions.	Posterior gastrojejunostomy, long loop, suture.	Well, 4 yrs. 4 mos.
1904	881	Gastrectasis, gastroptosis.	Posterior gastrojejunostomy, long loop, suture, secondary entero-enterostomy, Murphy button.	Died, 1 yr. Intestinal obstruc.
1904	1359	Ulcer of duodenum, perforated.	Duodenorrhaphy, posterior gastrojejunostomy, long loop, suture; 2d entero-enterostomy, Murphy button.	Well, 3 yrs. 7 mos.
1904	1705	Ulcer of stomach, stenosis of pylorus.	Posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button.	Well, 3 yrs. 4 mos.
1904	2023	Ulcer of stomach, perforated.	Gastrorrhaphy, posterior gastrojejunostomy, long loop, entero-enterostomy, Murphy button.	Well, 3 yrs. 3 mos.
1904	3080	Ulcer of stomach, stenosis of pylorus.	Posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button.	Died, 2 mo. exhaust.
1904	4010	Ulcer of stomach.	"	Died, 3 yrs. 2 mos; nephritis.
1905	137	Stenosis of pylorus due to mass.	"	No imp. 3 yrs.
1905	293	Ulcer of stomach, cicatrix of pylorus.	"	Well, 2 yrs. 11 mos.
1905	560	Ulcer of stomach, stenosis of pylorus.	"	Died, 2 mo. exhaust.
1905	613	Ulcer of stomach, stenosis of pylorus.	"	Imp. 2 yrs. 11 mos.

TABULATED STATEMENT SHOWING END-RESULTS FOLLOWING OPERATIONS FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM (*Continued*).

Date.	Case No.	Diagnosis.	Operation.	End-results.
1905	747	Stenosis of pylorus.	Pylorectomy, post. gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button.	Died, 5 mos. anasarca.
1905	1054	Ulcer of stomach.	Posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button.	No imp. 2 yrs. 8 mos.
1905	1163	Ulcer of stomach, stenosis of pylorus.	"	Well, 2 yrs. moved to Ireland.
1905	1381	Ulcer of duodenum, induration.	Posterior gastrojejunostomy, no loop, suture.	Well, 2 yrs. 7 mos.
1905	1494	Ulcer of stomach, stenosis of pylorus, adhesions to liver.	Posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button; secondary ligation of pylorus.	Well, 2 yrs. 2 mos.
1905	1927	Stenosis of pylorus.	Posterior gastrojejunostomy, no loop, suture.	Well, 2 yrs. 4 mos.
1905	1986	Ulcer of stomach, stenosis of pylorus.	Posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button.	Well, 2 yrs. 4 mos.
1905	2196	Ulcer of stomach.	Posterior gastrojejunostomy, long loop, suture.	Well, 1 yr. 4 mos., killed in mine.
1905	2289	Ulcer of stomach, stenosis of pylorus.	Posterior gastrojejunostomy, no loop, suture.	Well, 2 yrs. 2 mos.
1905	2491	Ulcer of stomach, stenosis of pylorus.	"	No. imp. 2 yrs. 2 mos.
1905	2595	Ulcer of stomach, hour-glass contraction.	Gastrogastrorrhaphy, postgastrojejunostomy, no loop, suture.	Imp. 2 yrs. 2 mos.
1905	2610	"Vicious circle" pylorus occluded by old cicatrix.	Entero-enterostomy, Murphy button. Ligation of pylorus.	Imp. 2 yrs. 3 mos.
1905	2621	Ulcer of duodenum, stenosis of pylorus.	Posterior gastrojejunostomy, no loop, suture.	Well, 2 yrs. 1 mo.
1905	2697	Ulcer of stomach.	Posterior gastrojejunostomy, long loop, suture. Secondary gastroduodenostomy, entero-enterostomy, Murphy button.	Imp. 1 yr. 6 mos.
1905	2726	Ulcer of stomach, cicatrix of pylorus.	Posterior gastrojejunostomy, no loop, suture.	Died, 1 yr. Cause?
1906	178	Erosion of Dieulafoy.	"	Well, 2 yrs.
1906	204	Erosion of Dieulafoy.	"	Imp. 2 yrs.
1906	280	Ulcer of stomach, stenosis of pylorus.	"	Well, 2 yrs.
1906	437	Ulcer of duodenum, stenosis of pylorus.	"	Well, 1 yr. 11 mos.
1906	939	Ulcer of stomach, cicatrix of pylorus.	"	Well, 1 yr. 9 mos.
1906	1234	Ulcer of stomach.	"	Well, 1 yr. 9 mos.

TABULATED STATEMENT SHOWING END-RESULTS FOLLOWING OPERATIONS FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM (*Continued*).

Date.	Case No.	Diagnosis.	Operation.	End-results.
1906	1319	Ulcer of stomach, cicatrix of duodenum, adhesions of stomach and liver.	Posterior gastrojejunostomy, no loop, suture.	Well, 1 yr. 8 mos.
1906	1407	Gastrectasis.	"	Well, 1 yr 8 mos.
1906	1408	Ulcer of stomach, stenosis of pylorus.	"	Well, 1 yr. 8 mos.
1906	1413	Ulcer of duodenum.	"	Well, 1 yr. 7 mos.
1906	1427	Stenosis of pylorus.	"	Well, 1 yr. 7 mos.
1906	1462	Obstruction of pylorus by adhesions.	"	Imp. 1 yr. 7 mos.
1906	1609	Ulcer of stomach with gastrectasis.	"	No imp. 1 yr. 6 mos.
1906	1942	Erosion of Dieulafoy.	"	Imp. 1 yr. 5 mos.
1906	2035	Ulcer of stomach, gastrectasis with ptosis.	"	Well, 1 yr. 5 mos.
1906	2226	Ulcer of stomach.	"	Well, 1 yr. 4 mos.
1906	2288	Ulcer of duodenum.	"	Imp. 1 yr. 3 mos.
1906	2545	Gastrectasis.	"	Well, 1 yr. 2 mos.
1906	2611	Erosion of Dieulfoy.	"	No imp. 1 yr. 2 mos.
1906	2726	Ulcer of stomach, with stenosis of pylorus.	"	Imp. 1 yr. 2 mos.
1906	2976	Ulcer of duodenum, adhesions.	"	Well, 1 yr. 1 mo.
1907	180	Ulcer of stomach.	Posterior gastrojejunostomy, no loop, clamps.	Well, 1 yr.
1907	329	Ulcer of duodenum, cicatricial contraction.	"	Well, 11 mos.
1907	570	Gastrectasis.	"	Well, 11 mos.
1907	805	Ulcer of stomach, hour-glass contraction.	Gastrogastrostomy, post. gastrojejunostomy, no loop, clamps.	Well, 10 mos.
1907	921	Ulcer of duodenum.	Posterior gastrojejunostomy, no loop, clamps.	Well, 10 mos.
1907	1060	Ulcer of duodenum, perforated.	Duodenorrhaphy, poster. gastrojejunostomy, no loop, clamps.	Well, 9 mos.
1907	1236	Stenosis of pylorus, adhesions to liver.	Partial gastrectomy, post. gastrojejunostomy, no loop, clamps.	Well, 8 mos.
1907	1606	Gastrectasis.	Posterior gastrojejunostomy, no loop, clamps.	Died, 7 mos. No Imp.
1907	1737	Ulcer of duodenum.	"	Well, 6 mos.

attacks, vomitus consisting of partly digested food. No blood. Lost twenty pounds in six weeks. Operation, November 19, 1902. Lesser curvature of stomach on level with umbilicus, greater curvature five inches below. Posterior gastrojejunostomy, long loop, suture. February 4, 1908. No symptoms. In good health. Has gained sixty-six pounds.

V. Patient 1291, 1903.—Male, aged forty-five years. For eight years had suffered from stomach trouble with marked constipation. Tenderness last year over gall-bladder region. Operation, June 11, 1903. Chronic cholecystitis. Pylorus thickened and contracted. No scars discernible. Cholecystostomy. Pyloroplasty. January 27, 1908. Slight soreness over gall-bladder. No stomach symptoms. Health good. Has gained in weight.

VI. Patient 1385, 1903.—Female, aged forty-eight years. Subject to stomach and liver troubles for last ten years. Attacks would recur at intervals of about ten months, lasting two to three weeks. Ten months ago had severe attack with coffee-ground vomitus, which was very acid. Abdomen distended, some tenderness in epigastric region. Operation, June 24, 1903. Ulcer of stomach with stenosis of pylorus. Pylorectomy, posterior gastrojejunostomy, long loop, suture. Pathological diagnosis. Hyperplasia of submucous and muscular coats, extensive round-celled infiltration. February 3, 1908. No symptoms. In fine health. Has gained normal weight.

VII. Patient 1482, 1903.—Female, aged twenty-four years. For three years had fulness and distress after eating. For two years became nauseated after eating, with vomiting. No blood in vomitus or stools. Steady dull pain, burning in character just above umbilicus. Not relieved by eating. Operation, July 23, 1903. Numerous adhesions around neck of gall-bladder and duodenum. Stomach slightly enlarged, in rather low position, pyloric opening thickened and lumen narrowed. Posterior gastrojejunostomy, long loop, suture. Persistent vomiting after operation. Second operation, July 18, 1903. Anastomosis in good condition. Entero-enterostomy, Murphy button. Patient died in September, 1905, cause of death not known.

VIII. Patient 1604, 1903.—Male, aged thirty-two years. For twelve years had stomach trouble. About once yearly would have attacks of pain in epigastrium, with soreness and vomiting. Pain relieved by taking food. Attacks lasted three to four weeks. Ten days had severe attack, pains in epigastrium and over gall-bladder, referred to shoulders. Vomiting, but no blood in vomitus at any time. Operation, July 23, 1903. Stomach increased in size, greater curvature about two inches below umbilicus. Adhesions of pyloric end of stomach to gall-bladder. Cicatrix of ulcer. Posterior gastrojejunostomy, long loop, suture. Persistent vomiting after operation. Second operation, August 3, 1903. Anastomosis in good condition. Entero-enterostomy. Murphy button. January 28, 1908. No symptoms. In good health. Gained thirty-four pounds.

IX. Patient 1750, 1903.—Male, aged forty-one years. Had enteric fever eighteen years ago, followed by "stomach trouble," which has persisted. Last two years could not eat much solid food. Last three months has lost twenty pounds. Operation, August 15, 1903. Stenosis of pylorus. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. January 27, 1908. No symptoms. In good health. Has gained forty-four pounds.

X. Patient 2166, 1903.—Female, aged forty-seven years. "Indigestion" last twenty years. Pneumonia ten years ago; enteric fever nine years ago. Two years ago had sudden attack of dull pain in epigastrium, which increased in severity and extended over entire abdomen. Pains relieved by vomiting, the vomitus being at times blood streaked. Stools very dark during attacks of pain. Operation, October 14, 1903. Ulcer of stomach with cicatricial mass near pylorus. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. February 11, 1908. No stomach symptoms. In good health, except is rheumatic.

XI. Patient 2245, 1903.—Had "indigestion" at irregular intervals for fifteen years. Fifteen months ago had sharp epigastric pains which radiated to back. Has had but one attack of hematemesis. Nausea and vomiting of undigested food about half hour after meals. Operation, October 24, 1903. Stomach

dilated, extending below umbilicus; cicatrix from ulcer, with adhesions, near pylorus. Posterior gastrojejunostomy, long loop, suture. February 3, 1908. No symptoms. "Not better in years." Has gained thirty-five pounds.

XII. Patient 881, 1904.—Female, aged forty-six years. Erysipelas of face recurring from age of eight once or twice yearly for years. Had three large pulmonary hemorrhages, at short intervals, twenty years ago. Had "indigestion" last thirteen years. Eructations, hiccoughs, gastric distress with pain after eating. No vomiting. Has been on milk diet for weeks at a time. Operation, May 14, 1904. General lengthening of the mesentery of the bowel, with ptosis of stomach and intestine. Stomach was very much dilated. Posterior gastrojejunostomy, long loop, suture. Persistent vomiting after operation. Second operation, May 31, 1904. Anastomosis in good condition. Entero-enterostomy, Murphy button. Re-admitted to German Hospital May 21, 1905, in a very weak condition, abdomen markedly distended, constant vomiting. Condition has lasted three days. Operation May 21, 1905. Omentum adherent to parietal peritoneum. Obstruction of bowel by bands, with volvulus of mesentery. Obstruction relieved. Patient died on the table.

XIII. Patient 1359, 1904.—Male, aged thirty-two years. For nine years had been a sufferer from epigastric pains, nausea, and constipation. Could not vomit. Day before admission had excruciating pains, worse in right hypochondrium. Operation, July 3, 1904. Perforated ulcer of duodenum. Ulcer 3 mm. in diameter. Ulcer closed with silk Lembert suture. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. February 1, 1908. No symptoms. In fine condition.

XIV. Patient 1705, 1904.—Male, aged forty-eight years. Had first attack of "stomach trouble" nineteen years ago, lasting two weeks. Loss of appetite, vomiting, constipation, pains in epigastrium. Six years later had similar attack lasting several weeks. In last four or five years attacks have become more frequent. Pain usually relieved by phosphate of soda. Has been under treatment for years. Operation, September 9, 1904. Ulcer of

stomach with cicatricial contraction near pylorus. Posterior gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button. January 26, 1908. No symptoms. In fine health.

XV. Patient 2023, 1904.—Had had "indigestion" for years. Admitted to hospital with history of sudden attack of pain in epigastrium, followed by sweating, collapse. Abdomen distended and tender. Operation, October 24, 1904. Ulcer of stomach, perforated. Ulcer closed with silk Lembert suture. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. January 30, 1908. Has no symptoms, no suffering but complains of lack of strength.

XVI. Patient 2080, 1904.—Male, aged thirty years. Was operated upon about two months before admission, for mastoid disease (at another hospital). Five weeks before admission had sharp pain after eating solids, pains lasting about ten minutes. Gradually increased in severity, so that he could take nothing but liquids. Continuous nausea after eating, but no vomiting. Operation, November 17, 1904. Stomach walls thicker than normal near pylorus, and pyloric opening constricted. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy. Patient died about January 1, 1905, there having been no improvement in his symptoms. Died from inanition and exhaustion.

XVII. Patient 4010, 1904.—Male, aged twenty-four years. Had had "indigestion" for years. Eructations of gas, marked pain after eating, nausea, and vomiting. At times blood in vomitus. Operation, November 23, 1904. Ulcer of stomach. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. Patient died in January, 1908, from nephritis. Had had no stomach symptoms after operation.

XVIII. Patient 137, 1905.—Male, aged thirty-seven years. For seven years had gastric distress, worse after eating, constipation, loss of weight. Vomiting at long intervals. Mass palpable to left of umbilicus. Operation, January 21, 1905. Pylorus thickened, lumen contracted. No other lesion found in stomach or intestine. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. January 31, 1908. At times has

same symptoms as before operation. Under medical treatment. Health poor. No natural bowel movements.

XIX. Patient 293, 1905.—Male, aged thirty-one years. For eight years had gastric cramps. No vomiting until four years ago. Constant dull, aching pain in epigastrium, worse at night. Vomiting. Operation, February 9, 1905. Ulcer of stomach with cicatrix near pylorus. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. January 24, 1908. No symptoms. In good health. Gained in weight.

XX. Patient 560, 1905.—Male, aged twenty-four years. For years had had "stomach trouble." Last eight months had cramp-like pains in stomach, worse at night, aggravated by eating. Constant pain during last month. Operation, March 23, 1905. Ulcer of stomach, with cicatricial stenosis of pylorus. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. Patient died about two months after operation. Had had persistently blood stools. Death probably due to exhaustion and inanition.

XXI. Patient 618, 1905.—Male, aged thirty-eight years. Indefinite history of "stomach trouble" extending over years. During last year had marked pains in stomach, worse at night. Solid food vomited twenty-four hours after ingestion. Operation, March 23, 1905. Ulcer of stomach near pylorus, with stenosis of pylorus. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. January 24, 1908. Much better than before operation. Health fair. Has gained in weight.

XXII. Patient 747, 1905.—Female, aged sixty-five years. For seven years had pains in epigastrium after eating, vomiting two or three hours after meals. No hematemesis. Operation, April 7, 1905. Stenosis of pylorus. Pylorectomy; posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. Pathological Report. Fibrous thickening of submucous and muscular coats. Patient died about five months after operation, having developed general anasarca; urine very scanty. Marked ascites.

XXIII. Patient 1054, 1905.—Female, aged twenty-nine years. For eight years had suffered from chlorosis. Had anorexia, vomiting, hematemesis, pain in stomach after eating. Operation, May 20, 1905. Ulcer of stomach. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. January 28, 1908. Attacks similar to those before operation persisted. Went to Scotland and entered Victoria Infirmary, Glasgow. Exploratory operation performed, everything found all right. Abdomen closed. Never free from suffering. Health same as before operation.

XXIV. Patient 1163, 1905.—Female, aged twenty-four years. For four years had gastric pains, with vomiting two hours after meals. Pain, burning in character. Operation, June 10, 1905. Ulcer of stomach with cicatrix near pylorus. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. Patient moved to Ireland in June, 1907, in fine health.

XXV. Patient 1381, 1905.—Male, aged thirty-five years. For five weeks had dull epigastric pains, about two hours after meals. No vomiting. Constipated. Lost thirty pounds. Operation, June 29, 1905. Ulcer of duodenum, with induration. Posterior gastrojejunostomy, short loop, suture. January 24, 1908. No symptoms. In splendid health. Gained twenty pounds.

XXVI. Patient 1494, 1905.—Male, aged thirty-one years. For two years had abdominal pains, vomiting after eating, with relief. Melena. Operation, July 14, 1905. Ulcer of stomach, stenosis of pylorus, with adhesions to liver. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. Pains continued after operation, persistent vomiting. Second operation, November 2, 1905. Anastomoses in good condition. Adhesions between pylorus and abdominal wall. Pylorus ligated with silk. February 11, 1908. No symptoms. In splendid health. Gained in weight.

XXVII. Patient 1927, 1905.—Female, aged twenty-eight years. Nine years ago had operation for appendicitis with secondary abscesses. Last two years has had "stomach trouble," great pain in epigastrium, with vomiting. Operation, September 17, 1905.

Circular thickening of pylorus. No scars. Posterior gastrojejunostomy, no loop, suture. January 30, 1908. No symptoms. Free from all suffering one year after operation. Has gained in weight.

XXVIII. Patient 1986, 1905.—Female, aged thirty years. For ten years had had dull, boring pains in epigastrium, vomiting. Hematemesis. Operation, September 14, 1905. Ulcer of stomach with stenosis of pylorus. Posterior gastrojejunostomy, long loop, suture; entero-enterostomy, Murphy button. January 29, 1908. No symptoms. Health very good.

XXIX. Patient 2196, 1905.—Male, aged twenty-three years. Operation, October 12, 1905. Ulcer of stomach. Posterior gastrojejunostomy, long loop, suture. Patient was in good health, with no stomach symptoms, November 11, 1906, when he was hurt while following his occupation of miner, from which injuries he died three days later.

XXX. Patient 2467, 1905.—Male, aged fifty-three years. Had "stomach trouble" for thirty years. Had ulcer of stomach, for which a pyloroplasty had been performed in another hospital five years ago. Was well until one year ago, when he had epigastric pains, with vomiting after meals, pains worse at night. Operation, November 11, 1905. Pylorus markedly indurated. Posterior gastrojejunostomy, no loop, suture. January 23, 1908. No symptoms. Health "could not be better." Gained twenty pounds.

XXXI. Patient 2491, 1905.—Male, aged twenty years. For two years had had epigastric pains, dull and heavy, after eating. Eructations of gas, nausea, but no vomiting. Constipated. Operation, November 18, 1905. Ulcer of stomach with stenosis of pylorus. Posterior gastrojejunostomy, no loop, suture. January 29, 1908. About same as before operation. Has distress and pain after eating. "Sour stomach," and constipation.

XXXII. Patient 2595, 1905.—Female, aged twenty-four years. For three years had epigastric pains after eating. Nausea, but no vomiting. Operation, November 11, 1905. Ulcer of stomach with hour-glass contraction. Stomach incised longitudinally and sutured transversely. Posterior gastrojejunostomy, no loop, suture.

February 18, 1908. Symptoms improved. During pregnancy had no symptoms, and was perfectly well. Since childbirth, symptoms have returned, but is better than before operation.

XXXIII. Patient 2610, 1905.—Had been operated upon in 1900, at another hospital, for ulcer, posterior gastrojejunostomy, Murphy button, having been performed. For one year was in good health; gained thirty-five pounds. Symptoms returned, vomiting, with pain in epigastrium. Operation, November 29, 1905. Gastrojejunostomy opening patulous but small. Pylorus occluded by old scar, partially. Entero-enterostomy, Murphy button. Ligation of pylorus, silk. February 11, 1908. Better than before operation, but has attacks of vomiting, the vomitus being bitter and very sour. Has gained in weight.

XXXIV. Patient 2621, 1905.—Male, aged forty-four years. As far back as patient can remember he has had dull pain localized at point midway between ensiform and umbilicus. Pain relieved by eating, returns about two hours after meals. No hematemesis. Has noticed blood streaks in stools. Lavage of stomach during past year. Slight relief. Operation, December 2, 1905. Ulcer of duodenum with thickening and constriction of pylorus. Posterior gastrojejunostomy, no loop, suture. January 23, 1908. No symptoms. In very good health.

XXXV. Patient 2683, 1905.—Female, aged twenty-nine years. Operation, December 11, 1905. Ulcer of stomach. Posterior gastrojejunostomy, long loop, suture. Readmitted to hospital April 6, 1906. Vomiting more or less constant since last operation. Second operation, May 19, 1906. Anastomosis in good condition. Pylorus occluded. Gastroduodenostomy, suture; entero-enterostomy, Murphy button. January 27, 1908. Some improvement. Health not good. Sick from time to time.

XXXVI. Patient 2726, 1905.—Male, aged twenty-eight years. For six years had "indigestion," epigastric pains, irregular vomiting. Loss of weight and strength. Operation, December 16, 1905. Ulcer of stomach, with cicatrix near pylorus. Posterior gastrojejunostomy, no loop, suture. Patient died December 14, 1906, cause of death not known.

XXXVII. Patient 178, 1906.—Male, aged forty-one years. No serious illness in adult life except pain over gall-bladder. Had exploratory cholecystotomy performed (in a southern city), no calculi found. Wound closed without drainage of gall-bladder. Had continued pain along right costal margin, dull and steady, at times referred to back. Never vomits, but is nauseated. Operation, January 11, 1906. Stomach enlarged, marked adhesions between pylorus and liver. On incision into stomach, mucous membrane found hemorrhagic. Posterior gastrojejunostomy, no loop, suture. January 10, 1908. No symptoms. "Never in better health in my life."

XXXVIII. Patient 204, 1906.—Male, aged thirty-four years. Two months before admission had violent attack of diarrhea, lasting four days, followed by constipation, which has persisted. Vomits at irregular intervals. Operation, January 31, 1906. Mucous membrane of stomach very hemorrhagic. Slight adhesion between pylorus and liver. Posterior gastrojejunostomy, no loop, suture. January 8, 1908. Better than before operation, but not well. Gained in weight.

XXXIX. Patient 280, 1906.—Female, aged fifty-seven years. Not well during the last eight months. About four weeks before admission had sudden attack of pain in epigastrium, with vomiting. Has been unable to eat solid food since that time. Vomiting begins about one hour after meals. Operation, February 3, 1906. Stomach dilated, ptosed, veins distended over greater part of surface. Pylorus opaque, thickened, and nodular. Mucous membrane of stomach markedly hemorrhagic. Posterior gastrojejunostomy, no loop, suture. February 8, 1908. Patient in good health. No symptoms.

XL. Patient 437, 1906.—Male, aged forty-one years. For twenty-four years had had "indigestion," accompanied irregularly with epigastric pains and vomiting. Operation, February 21, 1906. Ulcer of duodenum with cicatrix. Posterior gastrojejunostomy, no loop, suture. January 15, 1908. No symptoms since operation. Health very good. Gained thirty pounds.

XLI. Patient 939, 1906.—Female, aged eighteen years. For four years had discomfort in epigastrium, distress after eating, with

vomiting. No hematemesis. Tenderness over stomach. Operation, April 21, 1906. Ulcer of stomach with cicatrix near pylorus. Posterior gastrojejunostomy, no loop, suture. January 20, 1908. No symptoms. "General health very good." Gained in weight.

XLII. Patient 1234, 1906.—Male, aged forty-eight years. Enteric fever at fifteen years; malaria at thirty-eight years. For past three years had "stomach trouble," fulness of stomach with eructations. Pains in epigastrium, with vomiting. Lost twenty-seven pounds. Operation, May 23, 1906. Ulcer of stomach. Posterior gastrojejunostomy, long loop, suture. February 21, 1908. No symptoms. In very good health. Has gained fifteen pounds.

XLIII. Patient 1309, 1906.—Male, aged thirty-six years. For two years had epigastric pains, made worse by eating. Nausea and vomiting. No hematemesis. Operation, June 2, 1906. Ulcer of stomach, cicatricial contraction of pylorus, adhesions between stomach and liver. Posterior gastrojejunostomy, no loop, suture. February 21, 1908. No symptoms. In good health. Gain in weight.

XLIV. Patient 1408, 1906.—Male, aged forty years. For three years abdominal and epigastric pains, cramp-like, not affected by eating. Pain followed by vomiting. Operation, June 13, 1906. Ulcer of stomach with induration near pylorus. Posterior gastrojejunostomy, no loop, suture. February 22, 1908. No symptoms. Gain in weight.

XLV. Patient 1407, 1906.—Female, aged thirty-eight years. For two months had headaches, epigastric pains, nausea, vomiting. Distress in epigastrium immediately after eating. Vomitus at times blood tinged. Some pain in stomach most of the time. Operation, June 18, 1906. Stomach very much dilated, vessels engorged, serosa congested, slight if any stenosis of pylorus. Posterior gastrojejunostomy, short loop, suture. January 9, 1908. No symptoms. Health good. Normal weight.

XLVI. Patient 1413, 1906.—Female, aged eighteen years. For one year had epigastric pains, lately becoming very sharp and

severe, with vomiting. No hematemesis. Operation, June 14, 1906. Ulcer of duodenum. Posterior gastrojejunostomy, no loop, suture. January 24, 1908. Symptoms for which operation was performed have all disappeared, although patient is not very strong.

XLVII. Patient 1427, 1906.—Male, aged forty-six years. Has been sick for years. Uncontrollable vomiting, no blood in vomitus. Veins of abdomen very prominent. Operation, June 13, 1906. Stomach walls thickened, congested. Pylorus thickened, lumen narrowed. Posterior gastrojejunostomy, no loop, suture. January 15, 1908. No symptoms. Health "unusually good." Gained in weight.

XLVIII. Patient 1462, 1906.—Female, aged forty years. Operated upon ten years ago in southern city for cholelithiasis, calculi removed, gall-bladder drained. Six years later had biliary fistula for three days. One year later had attack of biliary colic. Bulging of scar, lanced by physician, fecal matter and pus released. Sinus discharging at time of admission to German Hospital. Operation, June 23, 1906. Adhesions between cicatrix and omentum, bowel, gall-bladder, and pylorus. Adhesions so dense around pylorus that function was impaired. Stomach slightly dilated. Posterior gastrojejunostomy, no loop, suture. January 26, 1908, is better than before stomach operation, but is not well. Has had pains similar to former attacks. Vomits bile at irregular intervals.

XLIX. Patient 1609, 1906.—Female, aged eighteen years. Exploratory celiotomy performed in 1904. Stomach found slightly dilated, pylorus patulous. No pathological lesions found. In February, 1905, was treated in medical wards for "stomach trouble." Had dull, heavy pains, suffocating in character, in epigastrium, worse after eating, with nausea and feeling of extreme weakness. Had to induce vomiting, after which pains were relieved. Notice bright red blood in vomitus lately. Operation. Stomach slightly dilated, walls congested, veins engorged. Small patch of fibrous tissue (cicatricial?) at pylorus. Omentum adherent. Incision into stomach revealed clot of blood. Posterior

gastrojejunostomy, no loop, suture. January 7, 1908. No relief. "Life a burden." Always miserable. Lost twenty pounds.

L. Patient 1942, 1906.—Female, aged forty-nine years. Had "inflammation of bowels" twenty years ago. Six months ago, after heavy cold, noticed distress after eating. Anorexia. No vomiting, but nausea. No sharp pains. Dull pain in epigastrium between meals. Losing weight rapidly. Marked tenderness and some rigidity in epigastrium. Operation, August 29, 1906. Walls of stomach thickened, veins prominent, and enlarged. No pyloric obstruction, no scars. Gall-bladder and duodenum apparently normal. Incision into stomach showed mucous membrane highly congested. A quantity of fresh blood found in stomach. Posterior gastrojejunostomy, no loop, suture. January 9, 1908. Much better than before operation. Stomach troublesome at times. Health fair. Same weight.

LI. Patient 2035, 1906.—Female, aged thirty-six years. Since childhood has had "stomach trouble," with irregular attacks of nausea, and vomiting associated with severe headaches. For last year had pains immediately after eating, with full, bloated feeling. Vomiting has been more or less constant, beginning immediately after meals. At times is blood tinged. Has vomited bright red blood. Pain relieved by vomiting. Operation, August 27, 1906. Ulcer of stomach, with gastrectasis and gastroptosis. Posterior gastrojejunostomy, no loop, suture. January 11, 1908. No symptoms. Health very good. Gained fifty pounds.

LII. Patient 2226, 1906.—Female, aged twenty-six years. For two years has had continued "stomach trouble," marked pain in epigastrium, with vomiting. Has lost thirty pounds. Operation, September 26, 1906. Ulcer of stomach. Posterior gastrojejunostomy, no loop, suture. January 15, 1908. No symptoms. In good health.

LIII. Patient 2288, 1906.—Female, aged twenty-seven years. For four months has had constant distress in stomach, worse about two hours after eating. No nausea or vomiting. No comfort after eating. Lost twenty pounds in four months. Operation, October 3, 1906. Ulcer of duodenum. Posterior gastrojejunos-

tomy, no loop, suture. January 14, 1908. Still has "stomach trouble." Health not very good, but better than before operation.

LIV. Patient 2545, 1906.—Female, aged eighteen years. For two years had noticed a "swelling" of the stomach which caused no inconvenience until eight months ago. Then had throbbing in left hypochondrium just below costal margin. Pain constant; never referred to back or shoulders. Number of dark blood clots found in stools during last year. Patient thinks "swelling" has been more marked on right side than left, although pain has been worse on left side. Operation, November 1, 1906. Stomach bulged out of wound. Enormously distended, walls thin. No apparent cause of distention. Posterior gastrojejunostomy, no loop, suture. February 10, 1908. No symptoms. In good health.

LV. Patient 2611, 1906.—Female, aged thirty-two years. Had enteric fever eleven years ago. Had attack similar to present one three months ago, lasting three to four weeks. Sharp cutting pain in epigastrium extending downward into abdomen. Nauseated, but could not vomit. Pain constant last eight weeks. Pain relieved by eating. Operation, November 10, 1908. No external evidence of disease in stomach. Stomach incised, mucosa greatly injected, bled easily when touched. Several small areas markedly hemorrhagic. One such spot ligated. Posterior gastrojejunostomy, no loop, suture. January 28, 1908. Symptoms same as before operation. No improvement in general condition.

LVI. Patient 2726, 1906.—For three years has had "stomach trouble." Pains in epigastrium, sharp and cutting in character, not relieved by food. Generally made worse. Never vomits, but is nauseated. Operation, November 21, 1906. Ulcer of stomach with cicatrix near pylorus. Posterior gastrojejunostomy, no loop, suture. January 16, 1908. For six weeks after operation had no symptoms. Since then has had "stomach trouble," but is much better than before operation.

LVII. Patient 2976, 1906.—Male, aged thirty nine years. For three months had sharp, stabbing epigastric pains, beginning two or three hours after eating. Relieved by eating. Vomiting marked, especially at night. Lost forty pounds. Operation,

December 24, 1906. Ulcer of duodenum with periduodenal adhesions. Posterior gastrojejunostomy, no loop, suture. January 7, 1908. No symptoms. "Never so well in my life." Gained forty-five pounds.

LVIII. Patient 180, 1907.—Female, aged thirty-two years. Always had "stomach trouble." Burning epigastric pains, worse after eating, relieved by vomiting. No vomiting last three months, but pain is severe. Operation, January 21, 1907. Ulcer of stomach. Posterior gastrojejunostomy, no loop, clamps. January 6, 1908. No symptoms. In good health. "A new woman." Gained twenty pounds.

LIX. Patient 329, 1907.—Female, aged forty-seven years. For six months had sharp epigastric pains followed by vomiting, especially in evening. Pains relieved by food, temporarily, getting worse about two hours after meals. Operation, February 4, 1907. Ulcer of duodenum, with contraction. Posterior gastrojejunostomy, no loop, clamps. January 23, 1908. No symptoms. Health steadily improving. Gained thirty-three pounds.

LX. Patient 570, 1907.—Female, aged fourteen years. Operation, February 28, 1907. Stomach greatly distended. Posterior gastrojejunostomy, no loop, clamps. January 23, 1908. Stomach greatly improved. Nerves upset. Gained twenty-five pounds.

LXI. Patient 805, 1907.—Female, aged thirty-eight years. Ten years ago began to have epigastric pains, relieved by vomiting. Pain cutting and severe. Vomiting relieved pain. Attacks at irregular intervals during last ten years. Operation, March 27, 1907. Ulcer of stomach with hour-glass contraction. Gastrogastrostomy, clamps, suture. Posterior gastrojejunostomy, no loop, clamps. January 7, 1908. No symptoms. Very fine health. About same weight.

LXII. Patient 921, 1907.—Male, aged fifty-six years. Operation, April 8, 1907. Ulcer of duodenum, beyond pylorus. Posterior gastrojejunostomy, no loop, clamps. February 1, 1908. No symptoms. In very good health. Gained thirty pounds.

LXIII. Patient 1060, 1907.—Male, aged fifty-one years. History of duodenal ulcer of ten years' standing. Perforated day of

operation. Operation April 21, 1907. Ulcer of duodenum, perforated. Duodenum infiltrated and thickened. Ulcer closed with silk Lembert suture. Posterior gastrojejunostomy, no loop, clamps. January 4, 1908. No symptoms. Fine health. Twelve pounds heavier than average weight before operation.

LXIV. Patient 1236, 1907.—Male, aged fifty-seven years. For eight months has had attacks of nausea, with vomiting, vomitus containing blood. Very little pain. Lost thirty pounds. Operation, May 9, 1907. Pylorus thickened and indurated, lumen contracted, adhesions to adjacent viscera. Partial gastrectomy; posterior gastrojejunostomy, no loop, clamps. Pathological diagnosis. Chronic hyperplasia of pylorus. January 6, 1908. No symptoms. Health steadily improving. Gained ten pounds.

LXV. Patient 1606, 1907.—Male, aged fifty-six years. Fifteen years ago had gastritis, lasting six months. Vomited fifteen minutes after meals. No nausea or pain. Few similar attacks until six months ago when there was great discomfort, vomiting of undigested food, but no blood. Operation, June 24, 1907. Gastrectasis. "Posterior gastrojejunostomy, no loop, clamps. January 16, 1908. Died this morning." No improvement since operation.

LXVI. Patient 1737, 1907.—Male, aged fifty-six years. For eight months had annoying but not severe pains in epigastrium. No vomiting, no nausea. Pains at times dull and aching, relieved by food. Tenderness over epigastrium. Operation, July 8, 1907. Ulcer of duodenum, with cicatrix. Posterior gastrojejunostomy, no loop, clamps. January 3, 1908. No symptoms. Health steadily improving. Gained ten pounds.

HOW FREQUENTLY DO GASTRIC ULCERS BECOME CARCINOMATA?

By WILLIAM L. RODMAN, M.D.,
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It is passing strange that internists in general do not more fully appreciate the accidents or surgical complications inseparable from gastric ulcer. While recognizing to a limited degree some of its dangers, such as hemorrhage and perforation, they are almost oblivious, as a class, to even greater dangers which either destroy the patient or transform him into a chronic invalid, for whom life has few attractions. We should keep constantly before us the statement of that conservative and accurate pathologist, Virchow, who emphasized the fact that 35 per cent. of all carcinomas are in the stomach, and we will show later on that at least one-half of them, probably more, are the direct result of neglected gastric ulcers.

That there are some few physicians who keenly appreciate the dangers, direct and indirect, functional and mechanical, of gastric ulcer and promptly refer suitable cases for operation is fortunately true, but that this class is a small one is only too apparent when the records of any operating surgeon are carefully studied, for it will be seen that a large percentage of all gastric operations are simply exploratory, the disease having advanced too far for a radical operation.

Of all the remote dangers of gastric ulcer, the greatest of them (malignant disease) is scarcely appreciated at all by physicians. And yet the idea that ulcer of the stomach may degenerate into malignant disease is by no means *new* or limited to surgeons. So long ago as 1839, Cruveilhier, although recognizing the intrinsic differences between ulcer and cancer, nevertheless clearly pointed

out that in one predisposed the former may become converted into the latter, and Rokitansky had stated that cancer may complicate perforating ulcer of the stomach.

In 1848 Dittrich reported eight cases in which carcinoma of the stomach had probably developed from ulcer. Remarkable as it may seem, Dittrich himself was not inclined to consider the association of the two processes as one of cause and effect, but rather believed it to be fortuitous.

Rokitansky, in 1849, had already accepted the belief that carcinoma was often preceded and caused by ulcer. I quote his words: "There are cases in which we can plainly see that a carcinoma has developed from an ulcer of the stomach."

Eight years later, in 1857, Brinton reported a case in which post-mortem examination proved beyond question that an ulcer had undergone carcinomatous degeneration, and that the malignant disease had developed in the edges of the ulcer and had gradually invaded the base.

From time to time reference was made to the subject by other authors, conspicuous among whom may be mentioned Waldeyer, Potain, and Zenker, all of whom expressed belief in the occurrence of malignant degeneration from simple round ulcer.

In 1883 Zenker's pupil, Hauser, made the most thorough study of the subject up to that time, with the result that he considered practically *all cases* of gastric carcinomata as consecutive to gastric ulcer, believing that the cancerous process may be superimposed either upon an ulcer still active or upon the cicatricial remains of one. As the result of histological studies of the edges of chronic ulcer during cicatrization, he found that there was only a slight difference between carcinomatous proliferation of the glandular epithelium and atypical growth of the glands during the formation of the scar.

In studying a carcinoma of the stomach which had been removed by Heinecke, Hauser observed too that there was considerable space between the base of the ulceration and the muscular layer of the stomach, a condition which he had never known to exist in primary gastric carcinoma.

Between the years 1883 and 1890 a number of other observations, notably by Haberlin, were recorded. This author described 14 cases, not all of which, however, could be considered authentic. He believed that 4 were undoubtedly positive, 6 fairly so, 3 probable, and 1 doubtful.

Sonnichsen found that out of 156 cases of carcinoma of the stomach which came to autopsy in the pathological institute at Kiel from 1873 to 1891, 22, or 14 per cent., undoubtedly developed in the scars of ulcers or in fresh ulcers themselves. He significantly remarks, and was one of the first to emphasize it, that most of these were at the pylorus. He further states that many others might have thus originated, but that the carcinomatous process was so extensive as to cover up preëxisting scars or ulcers, if such there were.

Klausa, working in the same institute, and following up the work of Sonnichsen, showed that between 1891 and 1900, there were a still greater number of carcinomata having their origin in ulcers. Out of 120 cases he positively determined that 32, or more than 26 per cent., grew from either ulcers or cicatrices.

Fütterer, of Chicago, in 1892, collected 52 cases demonstrating malignant change in ulcers originally benign; 7 were in his own practice. These cases were collected with great care from the literature, and but few, if any of them, admit of a reasonable doubt. The conclusions of Fütterer are so logical and reasonable that they should convince the most skeptical. They are as follows:

1. If a carcinoma develops from a chronic ulcer of the stomach, then this development occurs from those parts of the edges of the ulcer which are most exposed to mechanical irritation by the contents of the stomach.

2. In the pyloric region it is the lower pyloric margin of the ulcer which is most exposed to mechanical irritation and from which carcinoma develops. But other parts of the edges may be the ones involved when dilatations and adhesions have changed the position of the organ.

3. Development of carcinoma from ulcers of the stomach in the pyloric region occurs with great frequency, while such a development occurs less often in other parts of the stomach.

4. If this (3) be true, then we must in all cases in which an ulcer of the stomach or its scar narrows the pylorus recommend early a gastro-enterostomy to prevent the development of carcinoma. If a gastro-enterostomy has been made, then the mechanical irritation of the ulcer in the pyloric region by food is reduced, and the severe friction necessary to produce a carcinoma will probably not occur.

5. A patient suffering from the consequences of a stenosis of the pylorus, particularly if this be caused by ulcers and scars, should, if a gastro-enterostomy is not performed, be advised to eat slowly and little at a time, and be particularly careful about carbohydrates, and especially hard crusts of bread; they should avoid richly fried or other coarse food, and they should, as much as possible, confine themselves to liquid or semiliquid foods. A good deal of fatty food should be recommended.

6. Elderly people in particular, who have but few or no teeth, and a saliva which is insufficient in quantity and quality, must be most carefully advised as to their diet, and to such patients taka diastase should be administered.

7. From the fact that carcinoma does not develop from the large ulcers alone, but may be developed from the very smallest, the prognosis of ulcer of the stomach is bad. Our aim, therefore, should be to prevent the formation of ulcers, rather than to heal them after they are formed, and this may he done, at least to a certain extent, by the energetic treatment of all cases of chlorosis and secondary anemia which come under observation.

Fütterer also studied the age incidence, and found that persons from twenty-six to seventy-five have suffered such degenerative change.

It is also interesting to note that Schmincke, in 1902, reported a case in a patient aged sixteen years. Mayo Robson one at twenty, in the same year. Still younger subjects have suffered from gastric carcinomata, as I have encountered in reliable literature 6 cases between ten and twenty.

Ssapeshko found that, of 100 gastric carcinomas, only 10 cases did not originate on the base of a peptic ulcer. The same author reports cases which had developed pyloric carcinoma five or more years after a gastro-enterostomy had been done for ulcer.

Stich states that ulcer-carcinoma constitutes 30 per cent. of the entire number of gastric cancers.

Oettinger, in 1903, reported 3 cases, two of them demonstrating in a most striking manner the development of carcinoma upon the edges of chronic ulcer. Macroscopically it was impossible to differentiate between callous ulcer and carcinoma. Microscopically, however, cancer cells were found in both, taking origin apparently from the cul-de-sacs of the mucous glands adjacent to the ulcer. In one of these cases, although the lesion was extremely limited, it had, notwithstanding this fact, given rise to extensive metastasis in the liver. In this case the glandular cul-de-sacs were elongated and the mucosa thickened, its superficial portion being the seat of an interstitial gastritis of varying degree. The alveoli were also filled with cellular elements which had already begun to undergo malignant changes. These findings not only confirmed Fütterer's histological observations concerning the growth of cancer from the edges of ulcers, but also those made previously by Mathieu and Hayem relative to the condition of the alveoli.

The following year Jedlicka states that in a series of apparently inflammatory pyloric tumors, there were 26.6 per cent. of ulcer carcinomas demonstrated microscopically.

French observers, notably Doyen, consider that a large percentage of gastric carcinomata have their origin in inflammatory lesions.

Rivière-Jaboulay states that 20 per cent. of his cases were preceded by well-marked history of ulcer.

W. J. Mayo found that in 54 per cent. of the cases of cancer of the stomach submitted to resection in 1905–1906 at the Rochester Clinic, both the clinical history and pathological examination of removed specimens made it certain that the cancers had their origin in ulcers.

Moynihan writes: "In my last 22 cases of gastro-enterostomy for cancer, close inquiry was made into the previous history with respect to gastric ulcer. The evidence in this series of cases shows that in 16 out of 22 patients, 72.1 per cent., there had been previous gastric ulcer. The shortest interval between the attack of gastric ulcer and the onset of symptoms which led to my seeing the patient

for a condition which proved to be malignant was three years; the longest interval was twenty-six years."

Great significance should be given this statement of Mr. Moynihan, because of his former belief that cancer was infrequently preceded by ulcer.

Mayo Robson stated in his Bradshaw lecture, before the Royal College of Surgeons, that 59.3 per cent. of the cases of cancer of the stomach on which he had operated gave a history of chronic ulcer. He therefore insisted that the operation of excising the ulcer-bearing area must be more frequently done in the future. Furthermore, of 112 posterior gastro-enterostomies performed by Mr. Robson for ulcer, 4 patients died subsequently of carcinoma, which developed in one patient at the end of a year after a perfectly successful gastro-enterostomy; in one after two and one-quarter years; in another after two and one-half years, and in the fourth after three and one-half years. All enjoyed good health between the gastro-enterostomy and the onset of cancer symptoms. The time intervening renders it unlikely that a mistake in diagnosis could have been made in any but the first case. There are other cases in this series where it seems more than probable that death was due to cancer.

I have within two years encountered 9 patients suffering with gastric carcinoma; 7 of them were at the pylorus, all giving an unmistakable history of previous ulcer. In 2 the interval between the ulcer and its malignant transformation was as long as twenty-five years. In 2 others, both of whom were operated upon within the past six weeks, the interval was brief, less than a year in one of them.

Diagnosis. Naturally, it is asked if a clinical diagnosis of gastric ulcer undergoing cancerization can be made. In my judgment it is simply impossible to do so with anything approaching accuracy until the abdomen is opened, and even then after the growth is inspected, palpated, and carefully scrutinized, frequent mistakes must occur even with those most experienced in gastric diseases. Every surgeon to whom I have written has reported one or more cases where he had made such a mistake, and nearly all have empha-

sized the impossibility of making an accurate diagnosis save by the microscope.

In some cases the classical symptoms of chronic ulcer are so well marked that there is not the slightest suspicion of carcinoma, and it is only when the abdomen is opened that the true nature of the lesion is revealed. If patients thus affected are not operated upon, they succumb to hemorrhage and their death is attributed to bleeding from an ulcer. In another class of cases the symptom complex of ulcer is modified after two or more years, so that a well-founded suspicion of malignant degeneration may arise in the mind of the medical attendant. Anorexia becomes pronounced, the pain more constant, the attacks of hematemesis more frequent, the vomited blood darker. In addition to these two forms, which pathologically probably correspond to slow cancerous degeneration of an ulcer, and development of cancer upon the remains or edges of an ulcer, respectively, Tuffier has recently described a form to which he applies the term latent ulcer, cancerous almost from its beginning. Here the symptoms of ulcer are absent, or are present in very slight degree, such as mild dyspeptic disturbances, which may last for a number of months. After a short time, however, the signs of cancer develop rapidly, there being complete anorexia, vomiting of dark blood, considerable anemia, and rapid deterioration of the general health.

Oettinger, who has carefully investigated this subject, while admitting the impossibility of making an accurate diagnosis in a majority of instances, states that "there are, however, certain circumstances which may lead one to suspect malignancy; thus, if pain persists, despite the employment of dietetic and therapeutic measures, which generally control it in acute ulcer, and continues to be present late in the disease, we may justifiably expect that the lesion is not benign. The character of the pain is neither that of simple ulcer, which is so commonly relieved when the patient vomits or assumes a special position, nor is it that of cancer, which is, as a rule, not severe. The pain is violent, constant, radiating to the ribs, and thence to the lumbar region, particularly to the last dorsal or first lumbar vertebra. A second symptom is anorexia.

Refusing nearly all food, the patients rapidly become emaciated and weak. The amount of vomited matter is rarely large, although the patients vomit very frequently."

He later says: "Little of value is to be learned from analysis of the gastric contents in these cases, as the chemical characteristics may be the same as in simple ulcer."

The rapid and regular diminution or disappearance of hyperacidity at intervals is, according to those best versed in the subject, the most important sign to be derived from such examination. Hayem, who has done much work along this line, states that when hyperchlorhydria is superseded by achlorhydria, it is almost certain that cancer is developing.

Albu maintains that an early diagnosis of gastric cancer can oftentimes be made if it can be shown that a slight but progressive loss of weight is taking place. It may be so slight as to escape the notice of the patient and physician for some time, but finally it is so marked as to be apparent to all. He furthermore emphasizes the fact that this slight loss in weight continues in spite of extra nourishment taken between meals in the form of concentrated and easily digested foods. Therefore, he believes that if the patient loses weight steadily, although enjoying his meals, seemingly digesting them, and, in addition, partaking of nourishing food between meals, a diagnosis of carcinoma is justifiable. This loss of weight, he says, occurs in carcinoma of the fundus as well as of the pylorus. The differentiation between these two forms, he believes, may be made by testing the functional activity of the stomach. In the beginning of carcinoma of the fundus there is little or no diminution in motility; free HCl is markedly decreased or absent. Thus, we have a picture of chronic atrophic gastritis. In carcinoma of the pylorus, on the other hand, there is very early seen a marked impairment of gastric motility and a steady decrease in the amount of HCl; in other words, we have pyloric stenosis plus a constant diminution in the HCl from month to month, perhaps from week to week. The subjective symptoms are so widely variant in different cases, and in the same case from time to time, that they are practically valueless.

I fully endorse the above observation, having frequently seen patients the victims of inoperable growths when there were only the slightest gastric symptoms present.

The belief originating with Hauser, and reinforced by the opinion of Rosenheim, in 1889, that *ulcus carcinomatosum* is always characterized by hyperchlorhydria, is in my judgment inaccurate and misleading. That such may be the case on account of the acuteness of all symptoms where cancer follows ulcer I do not question, but that it is necessarily, or even usually, so has not been my experience. I fully endorse the opinions of Hayem that achlorhydria rather than hyperchlorhydria is the condition more likely to be encountered.

I wish to repeat what I have frequently said before, that gastric analyses are oftentimes misleading, and should never be absolutely relied upon in making a diagnosis.

In reference to examination of the blood, Hayem remarks that little if anything can be learned from it.

Age is certainly not the guide it was formerly thought to be, for we have shown that cancerous changes have taken place in patients from sixteen to seventy-five years of age. An analysis of the most authentic recorded cases, however, shows that the phenomenon of cancerization is most frequent in persons past forty.

PATHOLOGY. For a correct understanding of the whole subject, and particularly concerning the relation of gastric ulcer to gastric cancer, an adequate knowledge of the manner in which ulcers heal is important. Small shallow ulcers heal as the result of fibrous cellular thickening of the submucosa, so that the edges of the mucous membrane are drawn together and finally become blended with the muscular layer. A stellate scar of varying size remains (Rokitansky). If the entire ulcer undergoes this process and becomes covered with a layer of epithelium, it may be correctly stated to have healed. The protective layer of epithelium prevents action of the stomach acids upon the connective tissue, which is already poor in blood supply and, consequently, of low resistance. Thus, formation of connective tissue together with contraction inaugurate the process of healing, and consolidation of the approxi-

mated mucous edges end it. If the ulcers extend to the muscular layer of the stomach, however, this healing by connective-tissue proliferation can take place only very slowly, because connective-tissue corpuscles are very scanty in the interstices between the bundles of muscle fibers. Under favorable conditions, however, healing of such deep ulcers may occur, but instead of a scar there is firm adherence of the mucous membrane to the deep layers of the stomach, the intermediate layer having been destroyed during the acute stage of the sore. The glands in the periphery around the scar show various alterations in form as the result of the compression and distortion to which they have been subjected by the connective tissue. Their epithelium is also altered, being either purely cubical or cylindrical. Here and there the glands perforate the muscularis, where they may become dilated, forming sinuses, cysts, or large spaces lined with epithelium. The scar tissue itself seems poor in bloodvessels.

If the ulcer is large, perforates the muscularis, and becomes adherent to some neighboring structure, contraction of the scar tissue will not be sufficient to completely close the ulcer. Such ulcers do not heal. Although there is a proliferation of connective-tissue cells at its base, the surface remains exposed to the action of the gastric juice. If proliferation in the deep layers does not proceed *pari passu* with this disturbance in the surface part, then the ulcer becomes deeper, and hemorrhages, caused by erosion of large vessels, result.

The edges of the ulcer, as well as its base, are also subject to chronic inflammation, so that great thickening of the submucous tissue is observed.

Such pathological changes justify the physician, who is accustomed to see cases in which symptoms of gastric disease characteristic of ulcer have existed for years, in making a diagnosis of chronic ulcer with partial healing if some tumor-like thickening can be felt upon palpation. A circumstance which lends additional weight to this supposition is our clinical experience with carcinoma of the stomach, which we know usually causes death not later than eighteen months after the first manifestation of symptoms, frequently in

a much shorter time, rarely after a longer period. The apparent exceptions to this rule, namely, cases in which all signs of ulcer have been present for years, but in which postmortem examination reveals a carcinoma, I believe to be ones in which malignant has developed from the benign lesions. The changes in the glands must be borne in mind. As Hauser has demonstrated, the glandular proliferation is atypical, depending not upon an increase of normal function, but upon a diminution of the same; indeed, sometimes upon a complete cessation of action. They are overstimulated by irritation due to the greatly increased supply of nutriment they receive and by the absence, partial or complete, of the firm tissue which serves to support them. If this process continues while thickening of the scar tissue still goes on, the conditions for gradual transformation of the glandular elements into carcinoma are very favorable.

TREATMENT. We have, I think, not only shown that gastric ulcers frequently tend to undergo malignant degeneration, but that it is difficult, almost impossible, to recognize clinically the change which is going on. If cases are in a hospital where they can be carefully studied, and are under close observation, one may sometimes infer that cancerization of an ulcer has begun if the clinical history, gastric analyses, symptoms, and physical signs all, or most of them, point in the same direction. In the majority of instances, a diagnosis in the present state of our knowledge is simply out of the question. This, it seems to me, is the very strongest possible plea for a more frequent and early resort to exploratory laparotomy in all gastric cases of doubtful nature failing to yield to medical treatment within a reasonable time.

If after the lesion is inspected, palpated, and carefully examined in every way, malignancy, actual or potential, is to be feared, certainly radical treatment of such lesion is demanded, for W. J. Mayo writes me that "the main field for the Rodman operation, as we find it, is an inability at the operating table to tell a carcinoma from an ulcer. In three cases out of four, when we remove a suspicious ulcer, it proves to be a carcinoma, and a number of cases after gastro-enterostomy for supposed ulcer have developed carcinoma

so quickly as to make it almost certain that it existed at the time of the operation."

Unquestionably gastro-enterostomy lessens the irritation caused by food passing over an ulcerated surface, and, therefore, tends to diminish somewhat the chances of future malignant degeneration. It does not, however, prevent it, as can be shown by any number of cases subsequently going wrong one, two, three, four, five, or more years after an apparently successful gastro-enterostomy. Moreover, there is abundant proof that degeneration of cicatrices, as well as fresh ulcers, not infrequently takes place.

The difference between the operative mortality of a radical treatment of the lesion, whether it be by simple excision, pylorectomy, or partial gastrectomy, and gastro-enterostomy is slight, whereas, the end results are better, more abiding, and beneficent in every way, preventing, as the radical procedure does, future hemorrhage, perforation, hour-glass stomach, pyloric stenosis, and malignant degeneration.

The results of pylorectomy or partial gastrectomy for cancer have hitherto been far from encouraging, as Kocher, who has, perhaps, had the greatest experience in resections, has seen but 9 per cent. of his cases pass the three-year limit without recurrence. Better results in my judgment will not be forthcoming until physicians diagnosticate and refer their cases more promptly and surgeons are given an opportunity to operate while the lesion is still a local one, or, what is infinitely better, in a pre-cancerous state. No one hesitates to remove a suspicious lesion in the breast, the uterus, the lip, or the tongue, as the tendency to malignant transformation of such lesions is so generally appreciated as to be a surgical tenet. Why should a different rule be applied to the stomach? A pylorectomy or partial gastrectomy for ulcer is a comparatively simple affair, and followed by the best and most abiding results. It is necessarily a serious operation, and may be only of temporary benefit when carcinoma has actually developed.

Bibliography.

Cruveilhier. Anatomie pathologique du Corps humain, 1839.

Rokitansky. Oester. Jahrb., xviii, 1839.

Dittrich. Prager Viertegahrschrift f. die praktische Heilkunde V.

Rokitansky. Lehrbuch der Pathologische Anatomie, 1849.

Brinton. Diseases of the Stomach, 1857.

Hauser. Das chronische Magengeschwür sein Vernarbungs process und dessen entwicklung zum Magencarcinom, Leipzig, 1883.

Haberlin. Ueber die Verbreitung und die Aetiologie des Magenprebses. Deut. Archiv f. klin. Medizin, Band xliv; also Inaugural Dissertation, Kiel, 1892.

Sonnichsen. Inaugural Dissertation, Kiel, 1892.

Klausa. Ueber die Entslehungdes Magencarcinoms aus Chronischen Magengeschwüre. Inaugural Dissertation, Kiel. 1900.

Fütterer. Jour. Am. Med. Assoc., March 15, 1902.

Schmincke. Inaugural Dissertation, Wurtzburg, 1901.

Ssapeshko. Annalen d. Russ. Chir., 1900, No. 6. (Mitteilungen a. d. Grenzgeb. d. Med. u. Chir., 1902.)

Stich. Beit. z. Magenchir. in Bruns Beit., 1903, xl, No. 2.

Oettinger. La Semaine Médicale, xx, 1903.

Jedlicka. Chronische Magengeschwüre, Prague, 1904.

Mayo. Annals of Surgery, June, 1907.

Moynihan. Brit. Med. Jour., February 17, 1906, 370.

Robson. Brit. Med. Jour., November 17, 1906, 1345.

Tuffier. Diseases of the Stomach, 1907.

GASTRIC AND DUODENAL ULCERS SECONDARY TO WOUNDS OF THE URINARY BLADDER.

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An instance of hematemesis and perforated gastric ulcer causing death after a successful suprapubic lithotomy happened in my work in 1886, and was reported by me in 1887.[1] A young surgeon, earnestly advocating the then generally disfavored high operation for stone in the urinary bladder, was naturally a good deal chagrined at the death of a patient from so unexpected a complication. I at first considered the vomiting of blood, which happened on the eighth day, and the perforation of the stomach wall, which took place nearly two months later, as the results of a prior latent gastric lesion. I concluded at a later date that the fatal ulceration of the stomach might be fairly attributed to the same etiology as the duodenal ulceration, familiar to surgeons in those days, after burns of the surface of the human body.

Two years ago sudden death came to one of my patients by reason of a massive hemorrhage from a duodenal ulcer nearly four weeks after a traumatic extraperitoneal rupture of the bladder with extravasation of urine. The patient had seemed to be convalescing, notwithstanding the severe lesion of the bladder and the adjacent regions. This case recalled so forcibly my early experience of a similar character that I entered upon a more careful study of the etiology of these postoperative gastro-intestinal lesions, which within a few years past have attracted surgical attention.

[1] Proceedings of the Philadelphia County Medical Society, 1887, p. 8; Maryland Medical Journal, Baltimore, 1886–1887, xvi, 259; and The Polyclinic, Philadelphia, 1886–1887, iv, 246.

CASE I.—*Death from perforating gastric ulcer two months after suprapubic lithotomy.* In 1886 I operated in the Pennsylvania Hospital on a very fat man, with a poor circulation, aged sixty-three years, and by a suprapubic cut easily removed a large flat stone from the bladder. The bladder wall, the rectus muscles, and the skin were closed by three tiers of catgut sutures, and a drainage tube was inserted to drain the space between the anterior wall of the bladder and the pubic bone. The wound was dressed with gauze wet with a solution of mercuric chloride, after its edges had been dusted with iodoform. A catheter was kept in the urethra and bladder for twenty-four hours.

Some time before the lithotomy I had attempted to crush the stone with the lithotrite, after having accustomed the capacious urethra to the contact of instruments by passing bougies. The stone was, however, too large to be grasped by the lithotrite, and litholapaxy was abandoned. After a proper period of inactivity I etherized the man and introduced a rubber bag into the rectum and elevated the bladder by injecting twelve fluidounces of warm water into the bag. The bladder was then distended with from six to eight fluidounces of weak solution of mercuric chloride and the suprapubic opening made. The layer of fat in the superficial fascia was nearly two inches thick. The technique of these operative procedures was that usual at the date of operation. They seem somewhat antiquated now.

In about five days the drainage tube was withdrawn, and by the eighth day all the sutures in the skin were removed. Some urine escaped from the opening left by the drainage tube, though the bladder was frequently emptied with a catheter. On the evening of the eighth day the patient vomited about six fluidounces of blood. During the straining of vomiting on that day, and on account of sitting up in bed a few days later, the wound burst open throughout its entire length. The edges of the reopened wound were brought together by sutures of silkworm gut and shot.

The man's local condition continued pretty good, though his general condition was bad. The deep part of the wound closed and he passed urine normally by the urethra without any escape

through the hypogastric cut. The wound in the skin and fat, however, was covered with sluggish granulations, and repair therein was very inactive. The patient had persistent nausea, a dull uncomfortable feeling in the epigastrium, and a marked loss of appetite. Disease of the liver or stomach was discussed, but no diagnosis was reached. This was due probably to the fact that twenty-odd years ago surgeons were not so familiar with gastric ulceration as now. Efforts were made to improve his nutrition without much avail. Gradually he improved sufficiently to sit up in a chair daily, and the wound in the abdominal wall was almost completely healed. He had no urinary difficulty and was very comfortable except for great weakness and the continuance of pain at the epigastrium.

Two months after operation he was suddenly seized with intense pain in the epigastrium. This was immediately followed by profound shock, which continued without reaction until death occurred a few hours later. The necropsy disclosed a gastric ulcer about one and one-quarter inches in diameter, which by perforation had permitted the contents of the stomach to escape into the peritoneal cavity.

Case II.—*Death from duodenal ulcer nearly four weeks after rupture of the bladder.* In February, 1906, a man, aged twenty-three years, was admitted to the Polyclinic Hospital with fracture of the pelvis and extraperitoneal rupture of the bladder, caused by some iron beams falling upon him. There was a fracture at the pubes and a fracture or dislocation posteriorly. Marked extravasation of urine and severe hemorrhage took place into the tissues in front of the bladder, causing a large elliptical swelling to develop above the right Poupart's ligament. This swelling, which extended from the middle line toward the crest of the right ilium, was drained by a seven-inch incision, above Pougart's ligament, and the introduction of a large drainage tube. Urine escaped freely from the drainage tube and was withdrawn from the bladder by urethral catheterization for about two weeks. At the end of three weeks the tube was removed, because the temperature, as well as the local condition and the general symptoms of the patient, seemed to warrant the belief that serious septicemia had been averted and that

recovery would take place. The patient gave a history of two attacks of gonorrhea, the last of which occurred two years ago. His urine showed traces of albumin and red blood cells when examined after the injury. Later it contained pus and streptococci. His temperature was normal when he was admitted. Then it oscillated, and about a week after his injury reached 103°. Later it was from normal to 100°.

The man gained strength, though he was pale, the wound in the abdominal wall closed, and his bladder was able to take care of urination, expelling as much as twelve fluidounces during a urination. The urine contained some pus. The normal temperature and the rather frequent pulse showed nothing to excite special anxiety. The patient on the twenty-second day complained of some pain in his upper abdomen; but he slept fairly well, though a little restless and weak.

On the twenty-sixth day he had a sudden collapse, shown by a weak irregular pulse, rapidity of respiration, and free sweating. When I saw him a few hours later, he was greatly prostrated, and said that he felt as if he were being blown up inside his abdomen. He was evidently going to die. Catheterization obtained a considerable quantity of urine of a normal appearance. I was at a loss to explain the symptoms. He died early the next morning, despite active stimulation, with sudden symptoms of another collapse.

The necropsy was made by Dr. John M. Swan, the Clinical Pathologist of the Hospital. The important findings were:

The pelvic peritoneum was discolored a bluish black. The discoloration extended upward on both sides well toward the diaphragm. This was probably due to the extravasation of blood, which occurred when the pelvic girdle gave way posteriorly at the time the man was crushed under the falling iron. There was no fluid in the abdominal cavity. The retroperitoneal lymph nodes were slightly enlarged.

The bladder was empty except that it contained a very small quantity of very purulent fluid. It was ruptured in front just above the prostate gland, and communicated through this opening with a

large cavity running between the separated portions of the pubic bones, the ends of which were bare and roughened. The cavity extended downward and backward to the right along the rami of the pubes and ischium as far as the tuberosity of the latter. In addition, there was an extension of the septic cavity down the side of the right thigh to a point four inches below the groin.

The intestines were greatly distended everywhere except at the sigmoid flexure, where there was a marked contraction. The large intestine was very much distended and contained a large quantity of blood-stained contents; its mucous membrane, which was thickened and reddish, was studded with minute elevations with a blackish centre, and was intensely stained with extravasated blood. The small intestine contained a small amount of blood-stained material. In the jejunum the mucous membrane showed the normal rugæ stained red. The mucous membrane of the ileum was quite red, becoming in some places dark brown; at the lower part of the ileum the staining became quite black. On the posterior wall of the duodenum just below the pyloric ring was an ulcer about three-quarters of an inch in diameter. It was rounded with undermined edges; in its bottom there was a small area, which was covered with a small blood clot. When this clot was removed, an open bloodvessel almost 2 mm. in diameter was seen. The base of the ulcer was almost directly against the pancreas, which is here normally adjacent and connected with the duodenum.

The stomach was distended with a large quantity of blood and blood-stained food particles. The large amount of clotted blood formed almost a complete cast of the stomach. The gastric mucous membrane was coated with mucus and was blood-stained. No ulcers were present (Fig. 1).

The pancreas was fatty, as was the liver. The pancreas, spleen, kidneys, and liver were anemic. The lungs were hypostatically congested and edematous. The arch of the aorta showed atheroma, the myocardium was anemic.

The organic lesions found were fracture of the pelvis, extraperitoneal rupture of the bladder, chronic abscess of the pelvis and perineum, acute colitis, ulcer of the duodenum with hemorrhage,

FIG. 1.—Ulcer of duodenum mounted in gelatin.

and hemorrhagic infiltration behind the peritoneum. The cause of death was profuse hemorrhage into the alimentary canal.

Careful questioning of the young man's mother after his death failed to elicit any history of previous spitting or vomiting of blood. She insisted that he had never had pain or indigestion after eating, even when taking sour or highly seasoned food. I therefore reached the conclusion that the colitis and the fatal ulceration of the duodenum were sequences of the pelvic suppuration resulting from the rupture of the bladder, similar to duodenal ulceration which occurs at times subsequent to burning or freezing of the surface of the body. It must be admitted that the mother's decided negations may have been inspired by the fact that her son had been injured by an accident, and that she, therefore, may have wished to accentuate his previous healthy condition.

Dr. James A. Kelly, the surgical pathologist of the Polyclinic Hospital, made a microscopic examination of the ulcerative process and mounted the specimen for macroscopic inspection. He says: "Microscopic examination of tissue removed from side and floor of ulcer of duodenum shows normal mucosa, submucosa, and muscular layers of duodenum forming side of ulcer, excepting for moderate round-cell infiltration of all layers and some deposit of fibrin and blood on surface of mucosa. At the site of the ulcer all the layers of the duodenum have been destroyed and replaced by necrotic tissue containing a few leukocytes and fibrin. The floor of ulcer below necrotic area is made up of fully formed adult connective tissue, and is firmly adherent to pancreas. The section contains a cross-section of the artery from which hemorrhage occurred, and which does not show any signs of embolus or thrombus. The fibrous tissue indicates, in my opinion, an ulcerative process not of recent date (Fig. 2).

It may be contended that in both of these cases the gastro-intestinal ulceration had existed previously to the traumatism of the bladder. Two months and nearly four weeks, respectively, however, might, it would seem to me, be sufficient time to develop an ulcer having characteristics similar to those seen in the usual chronic peptic ulcer of the stomach and duodenum. No micro-

scopic examination was made in the first case; in the second, Dr. Kelly's report is appended. He, however, gives no definite opinion as to the exact age of the lesion, though he looks upon it as a chronic sore. I do not know that pathologists possess exact information as

FIG. 2.—Microscopic view of tissue from wall and floor of ulcer of duodenum: *A*, mucosa; *B*, glands of Brunner; *C*, circular, and *D*, longitudinal muscular fibers; *E*, floor of ulcer; *F*, fibrous connective tissue between intestine and pancreas; *G*, pancreas; *H*, artery from which hemorrhage occurred.

to the time really required to produce the histological changes seen in the section. It is known, however, that after gastrojejunostomy peptic ulcer of the jejunum may occur very early. Mr. Moynihan[1] has recorded death from perforation of such a jejunal ulcer about eleven days after operation, and mentions that he knows of a case

[1] TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION, 1908.

in which such a fatality took place in five days after operation. These instances apparently indicate that four to eight weeks was not too short a time in which to have developed the ulcerations found in my cases here reported.

It is impossible to fix the time of origin of these lesions, and indeed their pathological connection with the bladder traumatism may be disputed. Three possibilties present themselves to one's mind.

The ulcerative process might have no connection whatever with the suprapubic lithotomy in the one patient or the accidental injury of the pelvic structures in the other.

The operative and accidental disturbances might, on the other hand, be the direct cause of the cytological and histological changes leading to hemorrhage, ulceration, and perforation. A difficulty of explaining this relation by present pathological knowledge does not preclude the possibility. Thrombosis, embolism, toxemia, and other influences of circulatory and nervous origin might readily lower the resistance of the cells of the mucosa to the digestive action of the fluids of the stomach and duodenum, and open the way to autodigestion and ulceration.

The surgical disturbance of the patient's structures might, in the third place, be the cause of a renewal of activity in a latent or healing ulceration. Varicose veins in the mucosa of esophagus, stomach, or duodenum, and congestion of the portal system from hepatic cirrhosis or heart disease, or general arteriosclerosis might be contributing causes.

CASE III.—*Suprapubic lithotomy followed by death from hematemesis eight days after operation.* Broca[1] reports the following case: A man, aged sixty-five years, not manifestly an alcoholic, had been in previous good health except that for seven years he had had symptoms of vesical stone. He applied for hospital treatment because fifteen days previously he had had marked hematuria lasting a whole night. The patient was rather fat and showed no visceral symptoms, except a slight degree of pulmonary emphysema. By suprapubic lithotomy Broca removed, on October 16, 1891, a

[1] Bull. et mém. de la Soc. de Chirurgie de Paris, 1900, xxvi, 858.

large uric acid stone. He sutured the bladder, leaving a large tube in the bladder for drainage. On the third day, the temperature being 38° C., the patient was doing well, though some urine was escaping by the hypogastric wound. Local and general conditions were good until the evening of the sixth day, when, without suppuration in the wound and without fever, an abundant hematemesis took place. This was treated with ice externally and internally and ergotin. The next morning the patient was very feeble and very pale; but on the following day, which was the eighth after operation, hematemesis and the passage of blood in the stools occurred, and he died in the evening.

Necropsy showed stomach and intestine full of blood. No definite ulceration in the stomach was at first evident. No esophageal varices and no evident vascular rupture were found, but the whole gastric mucosa presented a marked wine-color tint. Transmitted light revealed on the greater curvature at the junction of two vessels an ulcer as large as a lentil. The abdominal wound was normal, showing no suppuration, and the vesical wound was united except at the point where the drain prevented union.

The liver appeared macroscopically to be normal, but histological examination showed beginning cirrhosis. Atheromatous change was very clear in the coronary arteries of the heart and in the aorta. Renal sclerosis was present. The stomach submucosa was infiltrated with interstitial hemorrhages, and its vessels were atheromatous. The only pathological change explaining the lesion and the hematemesis was arterial atheroma.

CASE IV.—*Lithotomy associated with chronic nephritis and duodenal ulcer; death in two days.* Perry and Shaw[1] give the history of a man, aged sixty-two years, who had had symptoms of stone in the bladder for eight years. After lithotomy, probably perineal, two large calculi were removed from the bladder. The man had delirium and died in two days. The autopsy showed tubal nephritis and a duodenal ulcer just beyond the pylorus with a linear cicatrix around it. The ulcer was considered by the reporters to be an old ulcer which had partially healed.

[1] Guy's Hospital Reports, 1893, p. 187.

CASES V and VI.—*Duodenal ulcer associated with pyonephrosis and perinephritic abscess. Duodenal ulcer associated with perineal abscess and scrofulous kidney.* The same authors report other cases of duodenal ulcer found in patients dying with septicemia associated with disease of the kidney of various types. In one of the cases there was pyonephrosis and perinephric abscess; in another, a perineal abscess associated with a scrofulous kidney.

CASE VII.—*Litholapaxy, followed by hematemesis; death on third day.* Purves reports a case operated upon by Annandale.[1] The patient, a man, aged sixty-seven years, had no gastric trouble previously. Urine was normal. On October 18, 1900, a uric acid stone was crushed and removed. There was no vomiting from the chloroform administered as an anesthetic. Three hours after the operation the man vomited a small amount of coffee-ground colored fluid without severe retching and without pain. On the next day he complained of some epigastric discomfort. The following day he was better. There was no pus in the urine. Sixty hours after operation the man vomited ten ounces of black fluid, became collapsed, and had an intermittent pulse and some distention of the abdomen. He was treated with strychnine, strophanthus, and lavage of the stomach with hot water. He fell in collapse again, and died without further vomiting five hours later. No autopsy was made. The reporter is not certain that sepsis was present in this case, but the man's general condition and the tympanites make it, he thinks, very probable.

CASE VIII.—*Lumbar nephrotomy followed by hematemesis; death in thirty-six hours.* In the same article is recorded another case occurring in the service of Annandale in 1901. A man, aged fifty years, had suffered with renal colic for eleven years. There was no history of gastric trouble. After lumbar nephrotomy for renal calculi, which was unaccompanied by chloroform vomiting, the man vomited blood. This occurred eighteen hours after operation, and the patient died thirty-six hours subsequent to that procedure. The urine had been found purulent, but there is no mention of a chemical examination having been made. The autopsy showed

[1] Edinburgh Medical Journal, 1902, liii, 238.

pus in the kidney. No ulceration was found in the stomach or duodenum.

CASE IX.—*Suprapubic lithotomy, hematemesis; death on the third day; two ulcers found in the stomach.* Purves, in the same collection, records the history of a patient operated upon by Chiene. A man, aged sixty-two years, had exhibited symptoms of vesical calculus for three years. He recently had developed a cystitis, but had never passed blood in the urine. The urine was purulent. There was no history of gastric trouble. Chiene did a suprapubic lithotomy in 1893, and drained the bladder. There was some vomiting from the chloroform. Forty-six hours after operation the patient vomited clotted blood in large quantity, and died fifty-four hours subsequent to operation. The autopsy revealed extensive atheroma. The stomach and upper part of the intestine contained dark blood. Two old ulcers were situated on the lesser curvature of the stomach. An arterial branch close to one of the ulcers had a clot in it discolored by stomach contents, but no perforation in the vessel could be established. There was calculous pyelitis of the right kidney.

CASE X.—*Lumbar nephrotomy followed by hematemesis; fatal on the third day.* Purves also mentions in the same article another case operated upon by Annandale. In this instance the man was young, being only twenty-seven years. Two uric acid calculi were removed from the right kidney, presumably by lumbar nephrotomy. The chloroform sickness, which was slight at first, increased in frequency on the following day and became more violent in the next twenty-four hours. Forty hours after operation black fluid containing blood replaced the bilious vomiting and continued until death, fifty-two hours after operation, which was twelve hours after the onset of hematemesis. There was no autopsy and there is no mention in the report as to whether there had been previous symptoms of gastro-intestinal trouble. There is no statement as to the coincidence of suppuration or septic symptoms. The fact that the bloody vomit replaced a previous bilious vomiting would, perhaps, indicate that the lesion was duodenal rather than gastric.

This collection of cases from one city, and in the practice of two

surgeons connected with one hospital, indicates that the condition is probably not unusual. A careful search of clinical records will probably result in the discovery of many additional instances.

Guyon[1] reports three cases of hematemesis after urinary infection. Recovery took place in two of the cases, and hence no exact knowledge of the gastro-intestinal lesions is possible in those instances.

Case XI.—*Hematemesis preceding death from coma in a patient with urethral stricture. Genito-urinary infection.* A man, aged seventy-one years, came under observation of Guyon on February, 19, 1901, in a comatose state with evidences of advanced urinary infection, but not in a condition for operative treatment. Repeated violent hematemesis occurred, and he died in coma on the second day. Autopsy showed urethral stricture and ulceration, cystitis and phlegmonous pericystitis, abscess in the bladder wall, ureteritis, and pyelitis. The kidneys macroscopically did not seem much damaged. The stomach was filled with blood. No ulceration of the gastric mucosa appeared to exist, nor was any lesion found in the esophagus or duodenum. There was merely a bloody effusion in the submucosa of the stomach in the pyloric region, without evident solution of continuity of the mucosa. Histological examination had not been made at the time of the report. The intestinal canal was otherwise normal macroscopically. There was no peritonitis, no appendicitis, and no evident lesion macroscopically of liver, heart, or spleen. The lungs were slightly congested at base. Microscopical study had not been made.

Case XII.—*Hematemesis after perineal incisions for extravasation of urine in urethral stricture; recovery.* A man, aged fifty-five years, was operated upon by Guyon, in 1878, for stricture of urethra by internal urethrotomy. In 1896 he suffered from infiltration of urine after maladroit catheterization. Incisions were made in the perineum, and he rapidly improved. When he was supposed to be out of danger an abundant vomiting of blood occurred. The blood was mixed with blackish clots. Recovery took place under the use of ice by the mouth. No recurrence has

[1] Sur les hématémèses toxi-infectieuses. Bull. de l'Académie de médecine, 1901, xlv, 226.

taken place. The man was seen at various times for several years afterward.

CASE XIII.—*Hematemesis after suprapubic removal of a vesical tumor; recovery.* A man, aged fifty-three years, had a urethral stricture, which had been successfully treated by gradual dilatation in 1894. Guyon states that about seven months later he complained of bloody urine, which was said to have existed for two years. In July, 1895, a growth was removed from the bladder by a suprapubic cut. A few days later the patient had quite abundant hematemesis which disappeared spontaneously in two or three days and did not return. The man was septic and had at the end of a month a phlebitis of the left leg, which lasted about six weeks. He was not seen again after he left the hospital.

CASE XIV.—*Fatal intestinal hemorrhage after lumbar nephrotomy.* Summers[1] operated upon a woman, aged twenty-five years, who was six months pregnant, for an acute pyonephrosis of the right kidney. He made a vertical cut in the loin. One week later the infection occurred in the left kidney also, which he similarly drained. There was more than usual manipulation of the mesocolon on the left side, though the peritoneum was not opened. It was observed that on this side the mesocolon was short. Twenty-four hours later abortion took place. On the fourth day after the second lumbar nephrotomy terrible intestinal hemorrhages occurred, resulting in death. No macroscopic ulcerations were found in the descending colon, but the mucosa was blood-stained. No further necropsy findings are mentioned.

Noble and Wathen have, according to Rodman,[2] each seen fatal gastric hemorrhage after nephrorrhaphy. The record is as follows:

CASE XV.—*Gastric and intestinal hemorrhage after bilateral nephrorrhaphy; death on twelfth day.* Noble operated on a young woman for fixing the kidneys, and lost his patient on the twelfth day from hemorrhage from the stomach and bowels. No autopsy was obtainable.

CASE XVI.—*Death from gastric hemorrhage after nephrorrhaphy.* Wathen saw hematemesis occur over a week after an operation for

[1] Medical Herald, St. Joseph, Missouri, November, 1906.

[2] Philadelphia Medical Journal, June 19, 1900.

fixing the movable kidney of a young neurotic woman. Death took place two or three days later. No autopsy was held.

In this series I have collected sixteen instances of gastro-intestinal bleeding subsequent to operative or other lesions of the urinary organs. The result was death in 14 cases, recovery in 2.

There were operations for cystotomy, 5; for litholapaxy, 1; for nephrotomy, 3; for extravasation of urine (bladder or urethra), 2; for nephrorrhaphy, 2. Total, 13.

There were non-operative lesions—pericystic abscess, etc., 1; perinephric abscess, etc., 1; perineal abscess, etc., 1. Total, 3.

In 7 of the 10 fatal cases ulceration was found at autopsy; in several of the remaining cases no necropsy was made and the question of the presence of ulcer of the stomach or intestine remains undetermined.

Curling said, sixty-four years ago, in his classic paper[1] on duodenal ulcers secondary to burns of the skin: "I have seen ulcers of this form in the same part of the intestine in other cases besides burns." In discussing duodenal ulceration after burns he called attention to the tendency of the ulcers to be situated in the first part of the duodenum and on its posterior wall, where it is close to the pancreas. He said that the ulcer is apt to have the pancreas for its base, and that a large open vessel is often seen on the floor of the ulcer. In most of the cases reported by him, death occurred in from seven to ten days after the injury. He raised the question of a possible connection of the ulcerative process with Brunner's glands. In a woman who died late of burns he saw a healed ulcer in the duodenum, which he considered to be the scar of a lesion consecutive to the burns.

Curling shows that Dupuytren had noted the occurrence of intestinal ulceration after burns, but calls attention to the fact that he did not seem to have recognized the special liability of the duodenum to this pathological process. It is interesting to note the similarity of the lesion in the second case of wound of the urinary bladder recorded by me in this paper with that described by Curling as a sequel to burns.

[1] Medico-Chirurgical Transactions, 1842, vii, 277.

Little or no attention appears to have been paid by clinical observers or pathological investigators to Curling's statement that duodenal ulcer was at times a sequel of other surgical lesions than burns.

For many years I have regarded the gastric bleeding and ulceration, which killed my suprapubic lithotomy case of 1886, as an evidence of a pathological sequence similar to that which takes place in the duodenum after extensive burning, and, I believe, also after extensive destruction of the integument from freezing.[1] The advent of antiseptic and aseptic methods in surgery has apparently been responsible for a marked elimination of duodenal ulcers secondary to these conditions. Whereas Holmes and Collins found this sequel in about 12 per cent. of their collection of burns, Lockwood has later found only one such ulcer in 138 cases treated with more or less successful attempts at antisepsis.[2]

Hematemesis and intestinal bleeding, as well as secondary ulceration of the stomach and duodenum, have attracted the attention of surgeons within recent years as symptoms seen occasionally after intraperitoneal lesions. Thus, Dieulafoy, Eiselsberg, Lieblein, Kehr, Rodman, Summers, Macrae, Bogolubow, Purves, Sauvé, and others have written on their connection with hernia, appendicitis, gall-bladder and gall-duct disease, and operations involving the great omentum or mesentery:

The association of these symptoms with lesions of a surgical nature unconnected directly with the peritoneum has, however, not been studied very thoroughly. This is rather strange, since, as has been stated, Curling referred to the subject over half a century ago. Samuel Fenwick and W. S. Fenwick[3] do, however, devote a few pages to secondary ulcers of the stomach and duodenum. They say that they are associated with infective disorders, portal obstruction, and trauma, but seem to lay most stress on their septic origin.

[1] Deutsche Chirurgie; Lieferung, xvii, Ueber Verbrennungen und Erfrierungen.

[2] Journal of the American Medical Association, August, 4, 1906.

[3] Ulcer of the Stomach and Duodenum and its Consequences, Philadelphia, 1900, 146, 158.

In 1893 Perry and Shaw[1] made this statement: "The association of ulceration of the duodenum with general septic or pyemic conditions has not, so far as we know, attracted attention in this country, although the fact that such an association existed was long ago suspected, we believe, by Billroth." These writers reported 18 ulcers of the duodenum to illustrate this connection out of a total of 70 duodenal ulcers from all causes in Guy's Hospital. They had knowledge of 3 additional cases not occurring in that institution; making in all 21 duodenal ulcerations in septic conditions. The septicemia was the result of sloughing of the scrotum, perineal abscess, perinephric abscess, bedsores, middle ear disease, cellulitis, sloughing of the skin, puerperal sepsis, and various other affections. The same authors attribute[2] to Moxon the suggestion that duodenal and gastric ulcers are often associated with nephritis; and, as evidence, report autopsy records of 12 cases of ulcer of the duodenum associated with nephritis in Guy's Hospital, and 4 additional cases collected from other sources. Of the 12 patients, 7 showed interstitial nephritis, 4 tubal nephritis, and 1 interstitial and tubal nephritis. Lecointe, Mathieu and Roux, Imerwol, and others have studied this question more recently.

The etiology of the gastro-intestinal lesions under consideration is obscure, but it is probably usually, though not always, connected with the occurrence of thrombosis and embolism due to septicemia or toxemia. Septic and urinary conditions giving rise to ammonium salts in the blood in large amounts have been especially accused as etiological factors. Cases are mentioned of such hemorrhage and ulceration occurring after operative procedures on regions far away from the abdomen and pelvis. Fracture of an extremity, excision of Gasserian ganglion, amputation of the thigh, removal of neuromatous tumor, excision of malignant disease of the palate and tonsils, and other surgical traumatisms followed by hematemesis or bleeding from the bowel have been reported a few times. These cases apparently prove that the postoperative bleeding and ulceration of the gastro-intestinal tract are caused by some more general pathological influence than local interference with the

[1] Guy's Hospital Reports, 1893, l, 187.

[2] Ibid., 190.

abdominal and pelvic circulation alone. Experimental and clinical evidence of such hemorrhage and ulceration occurring through infection with the pneumococcus, the meningococcus, the diphtheria bacillus, the colon bacillus, a staphylococcus, and from uremic conditions give credence to the theory that changes in the gastric and intestinal mucosa leading to fatal issue may be the result of several local influences and also of a widespread pathological alteration in the cells and fluids of the body.

Nearly all the papers on this topic have discussed the questions from the idea that the operations causing the secondary phenomena under discussion must in some direct way involve the portal circulation. Although such lesions are probably more apt to occur after interference with the pelvic and abdominal organs, which are connected with the portal circulation, enough cases are on record to lead to a belief that a general condition, such as uremic intoxication, atheroma of the vessels, toxemia, or infection is instrumental in rendering the patient liable to the serious complication discussed. Investigation has been made by a number of experimenters upon the production of gastric and duodenal ulcers by interference with the nervous connections of the gastro-intestinal tract. In operative cases the high pelvic position of Trendelenburg may perhaps have an influence in disturbing the gastric and duodenal circulation and causing congestion of, or extravasation in, the mucosa.

Hort,[1] of Torquay, makes the suggestion that some forms of gastric and duodenal ulcers may be only local expressions of a general blood disease not heretofore recognized. His paper states that the occurrence of such ulcers depends upon a breakdown of the normal immunity of the gastric mucosa against autodigestion through destruction of the antipeptic bodies caused by thrombosis, embolism, necrosis, or other processes.

The ulcer itself is due apparently in his opinion to the presence in the blood of floating hemorrhagins, mucolysins, and other cystolysins, affecting the mucosa through one of two channels—either from the lymph stream constantly flooding the epithelial

[1] Lancet, 1907, ii, 1744.

cells with the specific toxins (mucolysins) or from the escaped blood charged with the same bodies.

Purves believes that the condition is frequently an obvious toxemia from a recognizable septic infection of the wound.

In these cases which I am discussing there is possibly a uremic toxemia in addition to the septic toxemia and infection. The mechanism of the thrombotic or embolic processes may, therefore, be more readily accounted for.

The serious prognosis in postoperative hematemesis or bloody stools is to be insisted upon.

Purves says: "The more marked the septic reaction in the wound, as shown by its discharges and the high temperature of the patient, the better is the chance for the patient's recovery." He believes that subdued or masked infection with subnormal temperature, frequent pulse, a rapidly increasing vital depression, and vomiting tending to become regurgitant render the prognosis graver. In his opinion the occurrence of bilious vomiting after one or two attacks of bloody vomit indicates a favorable outcome of the case.

The treatment may be divided into the prophylactic, the general, and the local. The recognition of the fact that the bleeding, in some cases at least, may be due to trauma of the vessels of the mesentery or great omentum suggests that the intra-abdominal organs should be handled with the utmost gentleness in all operative procedures. The probability that sepsis is the basis of this unfortunate complication in a great proportion of cases makes it desirable that all wounds, operative or accidental, intra-abdominal or extra-abdominal, be kept aseptic or be quickly made so. These two precautionary measures are the prophylactic means that the surgeon should always have in mind.

The general treatment consists in relieving the grave anemia and the depression which result from the loss of blood, whether it be retained within the stomach and intestines, or ejected by vomiting or stool. When there is no external evidence of bleeding by hematemesis or bloody dejections, the surgeon may fail to recognize the cause of the sudden collapse of his patient. The occasional advent

of postoperative gastro-intestinal bleeding should always be remembered. Hypodermic injections of strychnine, rectal enemas containing alcohol or other stimulants and nutritive materials, and perhaps the use of ergotin subcutaneously are indications in this instance, as in other cases of hemorrhage. If the patient has been in the high pelvic position, and it is believed that congestion of the stomach and intestines is increased by this posture, he should be restored to the horizontal position. This change in posture should be made gradually. It may, however, be improper, if there is danger of cerebral anemia resulting from the altered posture. It is possible that in some instances elevation of the shoulders and head so that the patient occupies a semisitting posture may be thought wise. This may lessen a congestion of the liver, stomach, and duodenum, if it be due to cardiac disease, for example, by increasing the hypostatic congestion of the pelvic organs and lower extremities. Cording the limbs so as to increase their venous congestion may perhaps aid in a similar manner. Autotransfusion, so-called, induced by applying bandages to the four extremities may be available in increasing the amount of blood in the brain and medulla oblongata. Hypodermoclysis or intravenous injection of warm saline solution or arterial anastomosis with a healthy individual may be valuable in selected cases. It is not impossible that instances might arise in which phlebotomy may be justified to relieve the engorgement of the right heart, the liver, and the mucous membrane of the gastro-intestinal tract.

Local measures should consist in total abstinence from the introduction of food into the stomach, though nutrient enemas may be employed. The stomach should be cleared of clotted blood and acid secretion by irrigation with a 2 per cent. sodium bicarbonate solution of a temperature of from 110° to 120° F. Rodman has recommended that the stomach be washed out with hot water of 120° to 130° F.[1] After the stomach has been emptied of its contents by repeated irrigation, nitrate of silver solution 1 to 1000 has been employed through a stomach tube and followed by ice cold water irrigation. It would seem to me that the hot water treatment is

[1] Journ Amer. Med. Assoc., September 15, 1906, p. 842.

better than that by ice cold water. Ice has been applied to the epigastrium in some cases. High enemas of hot water have been given for the purpose of clearing out the bowel and aiding in the arrest of the bleeding. Full doses of bismuth subnitrate might be given by the mouth with advantage. The use of adrenalin and cocaine solutions introduced into the stomach has been suggested, but their value may be considered doubtful.

Most writers on the subject under consideration have looked upon the surgical treatment of the bleeding point as unwise. They have usually counselled a reliance upon medical measures such as those already described. It is conceivable, however, that if the condition of the patient warranted it, local treatment of the ulcer in the stomach or duodenum should be instituted.

Gastro-enterostomy, excision of the ulcer, or ligation of the bleeding point suggest themselves. An incision in the stomach opposite to the bleeding point would, perhaps, permit the surgeon's finger, placed behind the ulcer, to push the bleeding surface through the opening and enable him to encircle the vessel with a purse-string suture carried through the mucous membrane and submucous coat.

Summers once operated by opening the abdomen, incising the stomach, and irrigating it with hot water. The patient seemed to be benefited, but the hemorrhages recurred and death finally took place. He suggests the possibility of using with advantage continuous irrigation, either through the esophagus or through a fistula made in the stomach.

Bibliography.

[For literature on Gastro-intestinal Ulcers after Burns, see Ueber Verbrennungen und Erfrierungen, Deutsche Chirurgie, Lieferung, xvii.]

Bergmann, Bruns, Mikulicz. Chirurgie der Gallenwege, Lehrbuch der praktischen Chirurgie, 1902.

Bezançon and Griffon. Ulcération gastr. au cours de la septic. pneumococcique chez la cobege, Bull et mém de la Soc. anat., March, 1899.

Billroth. Ueber Duodenalgeschwüre bei Septikämie, Wiener med. Wochenschrift, 1867, 704.

Bogolubow. Zur Frage des postoperativen Magendarmblutungen, Deutsche Medizinal-Zeitung, September 28, 1905, 869.

Brooks. The Pathological Anatomy of Gastric Ulcer, Medical News, October 8, 1904, p. 677.

Curschmann. Ueber Magenblutungen bei chronischer Pfortaderstauung, Deutsche med. Wochensch., 1902, No. 16.

Dalla Vedova. Experimentelle Beitrage zur Kenntniss der Pathogenese des Ulcus ventriculi, Arch. f. Verdauungskrankheiten, 1902, viii, 43.

Debove and Renault. Ulcère de l'estomac, Paris, 1892, p. 60.

Degny. Hématémèse dans la diphthérie, Bull. et mém. de la Soc. anat., July, 1899.

Dehler. Magenblutung nach Gallenblasenoperation, Deutsch. Zeitschr. f. Chir., Band lvii, 182.

Dieulafoy. Vomito nègre appendiculaire, Gastrite ulcéreuse hémorragique appendiculaire, Bull. de l'Académie de Médecine, 1901, xlv, 171.

Dieulafoy. Gastrite ulcéreuse pneumoccique, grandes hématémèses, Presse médicale, November 11, 1899, 281.

Eiselsberg. Ueber Magen- und Duodenalblutungen nach Operationen, Arch. f. klin. Chir., Band lix, 837.

Engelhardt and Neck. Die Veranderungen an Leber und Magen nach Netzabbindungen, Deutsche Zeitschrift f. Chir., 1901, lviii, 308. Ibid., 1902, lxii, 372.

S. Fenwick and W. S. Fenwick. Ulcer of the Stomach and Duodenum, Philadelphia, 1900, pp. 97, 130, 146, and 158.

Friedrich. Zur chirurgischen Pathologie von Netz und Mesenterium, Folgen von Netzalterationen für Leber und Magen, Zentralblatt f. Chir., 1900, 101, Beil. z. Zentr. f. chir., 28.

Gandy and Griffon. Erosions hémorrhagiques de l'estomac au cours d'une infection expérimentale à meningocoque de Weichselbaum, Bull. et mém. de la Soc. anatomique, 1901.

Gendre and Le Roy. Ulcérations gastriques et intestinales chez un sujet ayant succombé d'un maladie infectieuse, etc., Soc méd. des hôpitaux, July 1, 1898.

Gerassinowitsch. Rufski Wratsch, 46, 1903.

Guyon. Sur les hématémèses toxi-infectieuses, Bull. de l'Académie de médecine, 1901, xlv, p. 226.

Hort. A Note on Gastric Ecchymosis, Gastrostaxis, and Simple Gastric Ulcer; their possible relations to Hemorrhagins and Mucolysins, Lancet, 1907, ii, 1744.

Victor Imerwol. Archiv für Kinderheilkunde, 1906, xliii, 321.

Kalomenkin. Ueber Geschwürsbildung im Magen und Darm nach Bauchoperationen Westnik Chirurgie, 1901, No. 14.

Kehr. Anleitung zur Erlernung der Diagnostik der verschiedenen Formen de Gallensteinkrankheiten, 1899, 151.

Kirmisson. Gazette hebdomadaire, February, 1903.

Kraske. Archiv f. klinische Chirurgie, November, 1903.

Landow. Zur Kasuistik der Magenblutung nach Bauchoperationen, Arch. f. klin. Chir., Band lxvi, 900.

Lauenstein. Hämetemesis 13 Tage nach Operationen einer inkarzerierten Nabelhernie, Deutsch. Zeitschr. f. Chirurg., Band lvii, 180.

Lecointe. La duodénite ulcéreuse urémique, Thèse de Paris, 1903.

Letulle. Origine infectieuse de certains ulcères simples de l'estomac ou du duodenum, France méd., 1888, i, 965.

Lieblein und Hilgenreiner. Die Geschwüre und die erworbenen Fisteln des Magen-darm-kanals in Deutsche Chirurgie, 1905, 122. (Has a most elaborate

bibliography on the pathogenesis of gastric ulcers and postoperative gastro-intestinal bleeding, pp. 3 and 12.)

M. Litten. Ueber die Folgen des Verschlusses der Arteria mesaraica superior, Virchow's Arch., 1875, lxiii, 295.

Macrae. "Gastro-intestinal Hemorrhage with Portal Obstruction following Operation," Trans. Western Surgical and Gynecological Association, 1903, p. 282.

Mahnert. Appendicitis und Ulcus ventriculi, eine klinische Studie, Mitt. a. d. Grenzgeb. d. Med. u. Chir., Jena, 1907, viii, 469.

Mathieu and Roux. Sur un cas d'ulcération urémique de l'estomac et de l'intestin grêle, Revue française de médecine et de chirurgie, 1903, 151.

N. Moore. Cases of Gastric Ulcer Associated with General Degeneration of the Arteries, Trans. Path. Soc., London, 1882–1883, xxxiv, 94.

Murphy and Neff. New York Medical Journal, September 20, 1902, p. 497.

Pahr. Appendizitis und embolische Magenkrankungen, Münchener medizinische Wochenschrift, April 25, 1905, 793.

Palermo. Una nuova ipothesi sulla patogenesi dell' ulcera simplice dello stomaco, Riforma med., 1905, xxi, 1182.

Pastor. Papel de la infeccion en la patogenia de la ulcera del estomigo, Rev. val de Cien. med., 1900, ii, 167.

V. Pendred. British Medical Journal, November 17, 1900, p. 1473.

Perry and Shaw. Diseases of the Duodenum, Guy's Hospital Reports, 1893, pp. 187, 189, etc.

Pineau. Des hémorrhagies gastro-intestinales d'origine urémique, Thèse de Paris, 1899.

Plönies. Die Reizung des N. vagus und Sympatheticus bei Ulcus Ventriculi, Wiesbaden, Bergmann, 1902.

Poulain. Du rôle de l'infection dans la pathogénie de l'ulcère de l'estomac, Thèse de Paris, 1897.

Purves. Postoperative Hematemesis, with notes of eleven cases, Edinburgh Medical Journal, 1902, liii, p. 238.

Quiroga. Etude de l'ulcère gastro-intestinale d'origine infectieuse, Thèse de Paris, 1888.

Reichard. Drei Fälle von parenchymatöser Magenblutung, Freie Vereinigung der Chirurgen, Berlin, 1899.

Rindfleisch. Lehrbuch der pathologischen Gewebellehre, Leipzig, 1871, 131.

Mayo Robson. British Medical Journal, March 10, 1900, p. 564.

Rodman. Gastric Hemorrhage, Journal American Medical Association, June 16, 1900, p. 1517.

Rondot. Les hémorrhagies stomachales infectieuses d'origine angiocholitique, Arch. clin. de Bordeaux, 1895, iv, 545.

Rosenau and Anderson. Lesions in Stomach and Duodenum of Guinea-pigs after Subcutaneous Injections of Diphtheria Toxin, Journal of Infectious Diseases, January 1, 1907, p. 1.

Sarzyn. Wratschebnaja Gazetta, June, 1903.

Sauvé. Des hémorrhagies intestinales, consecutives à l'Opération des hernies in Général, Revue de Chirurgie, February, etc., 1905.

Schmidt. Magenblutung nach Cholecystektomie, Deutsch. Zeitsch. f. Chir., Band lv, 1900, 586.

Sthamer. Zur Entstehung von Magengeschwüren und Leberinfarkten nach experimenteller Netzresektion, Deutsche Zeitsch. f. Chir., 1901, lxi, 518.

William R. Stokes. Ulcer of Stomach caused by Diphtheria Bacillus, Johns Hopkins Hospital Bulletin, July, 1901, 209.

Stockton. Medical News, 1893, i, 35.

J. E. Summers, Jr. The Cause and Possible Prevention of Gastric and Intestinal Hemorrhages, following Operations for Appendicitis, Hernia, and all other Operative Procedures Involving the Blood Supply of the Omentum and Viscera, Medical Herald, St. Joseph, Missouri, November, 1906.

Testi. La patogenesi neurotropica dell' ulcera gastrica, Gaz. med. ital., 1902, liii, 191, 207, 221.

Türck. Ulcer of the Stomach: Pathogenesis and Pathology (Experimental Ulcers of Stomach and Duodenum), Journal American Medical Association, June 9, 1906, p. 1753.

Turner. Trans. Pathological Society, 1884–1885, xxxvi, 191.

Weir. Duodenal Ulcers, TRANSACTIONS OF AMERICAN SURGICAL ASSOCIATION, 1900, p. 5.

Widal and Mesley. Ulcère rond développé au cours d'une pyohémie à staphylocoques de l'origine infectieuse de certain ulcères ronds perforants de l'estomac, Bull. et mém. Soc. méd. des hôp. de Paris, 1897, xiv, 379.

K. Winslow. Boston Med. and Surg. Jour., September 27, 1900, p. 313.

Yzeren. Die Pathogenese des chronischen Magengeschwüres, Zeitsch. f. klin. Medizin, 1901, xliii, 181.

Zironi. La Riforma medica, 1906, xxii, 395.

INFANTILE HYPERTROPHIC STENOSIS OF PYLORUS.

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THE most complete operative statistics upon this subject up to October, 1906, are undoubtedly those given by Dr. George Thompson (*Surgery, Gynecology, and Obstetrics*, Chicago, 1906, iii, 521). These include 89 operative cases. To these I have been able to add 25 others collected to this date, not including one of my own, the history of which I wish to report at this time.

S. G., aged four and one-half weeks, male, white, was admitted to Charity Hospital, May 31, 1907. Father and mother living and well. No hereditary tendencies.

The child at birth weighed seven and one-half pounds, and had increased in weight to eight and one-half pounds at the end of three weeks; from this time on it began to vomit, ceased to urinate, bowels refused to move, and it lost in weight from one to four ounces daily up to the time of operation, when he was four and one-half weeks old and weighed six and three-quarters pounds.

The diagnosis made by Dr. J. P. Sawyer, who referred the case to me, was based upon the persistent and late character of the vomiting (about one hour after feeding), by its refusal to respond to changes in its feeding and to stomach treatment, by its progressive emaciation, and by the visible stomach peristalsis. We were not able, even with greatly emaciated abdominal walls, to palpate any pyloric enlargement or tumor. At the time of operation the baby was extremely feeble, looking like an ordinary marasmic infant, and having its face and scalp covered with a scaly eruption.

OPERATION UNDER ETHER ANESTHESIA. Median incision two and one-half inches long above umbilicus. The stomach was

partly delivered and the pyloric end was represented by a hard, almost cartilaginous feeling mass, which could not be indented by the fingers, measuring about two-thirds of an inch in length and a little over one-half inch in thickness. Stomach wall not particularly hypertrophied.

An anterior gastro-enterostomy was made, for the reason that it seemed it could be done with less stomach and intestinal exposure and manipulation and cause greatly less shock. The only difficulty was the minute caliber of the jejunum, but, as happens in the adult, after manipulation, the shrivelled and contracted jejunum swelled to nearly twice its apparent size and two small curved rubber protected clamp forceps were used to hold the stomach and intestine until the anastomosis was complete.

The parietes were closed by through and through silkworm-gut sutures.

The baby's temperature averaged 103° for several days following the operation, and it continued to lose in weight until the eighth day, when it weighed but six pounds.

The feeding of the infant presented many difficulties. Vomiting was easily stimulated. In general the feeding consisted of one ounce of albumin water every two hours, alternating with one ounce of diluted cream every two hours. In addition, the milk from its mother's breasts was pumped out and 1 ounce given by rectum to the child every four hours, and, in addition, frequent inunctions of sweet oil were resorted to. On the sixth day artificial mouth feeding was stopped and baby was put to the breast. Continued rectal feeding with peptonized milk. As it continued to fail, breast feeding was stopped on the tenth day and modified milk, composed of whey, cream, sugar of milk, and lime water, was given it from the bottle for a week, from which time milk was gradually added and improvement became marked, so that at the end of eight weeks its weight had increased to eight pounds, and at present the baby presents the appearance of any fairly well nourished child of one year.

So much has been written during the past eighteen months from the medical standpoint regarding the treatment of congenital

pyloric stenosis and in many cases deprecating surgical intervention, that it seemed to me worth while to review the surgical side of it up to this date and see whether we had anything definite and of demonstrable value to offer toward the alleviation of a condition which, I am sure, will become increasingly more frequent when the vague condition of marasmus is more carefully studied and the true pathological condition recognized.

Pathology. As no opportunity for microscopic examination presented itself in this case, nothing can be added to the theories already prevalent. That fetal pyloric stenosis from hyperplasia may occur is shown by Dent in a photograph of a specimen from a seven months' fetus, and it is suggested that this represents an atavistic tendency or reversion to an earlier type of development, since the circular muscle is well marked in the pylorus of many mammalia, or that the hypertrophied pylorus is analagous to the gastric mill of crustacea, the gizzards of birds, etc.

Some have ascribed this condition to a primary derangement of the nervous mechanism of the gastric muscle, resulting in incoordination, while the majority ascribe it to gastric irritations causing spasms of the pylorus and subsequent hypertrophy, and this in spite of autopsies in cases in which no hypertrophy was demonstrable, though persistent spasm had been a prominent feature.

Undoubtedly it would be of great aid in deciding whether to employ medical or surgical measures for relief were the true pathology settled, for a true congenital hypertrophy could scarcely be expected to subside under medical treatment, and would call for immediate operation without the delay incident to the institution of medical treatment, while we might confidently expect that a very considerable number of cases of acquired hypertrophy due to persistent irritation and spasm would be benefited or even cured by appropriate feeding and medical care.

It seems reasonable to suppose that both conditions may exist and may thus account for the varying results of treatment; and the number of cases simulating stenosis, in which pyloric spasms exist without hypertrophy, may add a considerable group to those reported as cured medically.

Until more definite means can be established for determining which are congenital and which acquired cases, it would seem that the term infantile hypertrophic pyloric stenosis would be preferable to congenital.

Of the symptoms of infantile pyloric stenosis, peristalsis is undoubtedly the most important single one, and is mentioned in 15 out of 18 cases, or in 84 per cent. This is a considerably higher percentage than that given by Thompson, who estimates it at about 33⅓ per cent.

Pyloric tumor is a most important though not constant symptom, and is apparently being more commonly recognized with increasing observations; thus, Thompson quotes Nicoll as stating that he palpated a tumor in 20 per cent. of his cases. Scudder says it was reported present in 18 per cent. out of 115 cases. In 14 cases reported by Thompson since January, 1905, it was present in 50 per cent., while in 13 additional recorded cases which I have collected it was present in 69 per cent.

In considering the treatment best to be advised in these cases, the question of prognosis naturally must influence us for or against surgical intervention. In true congenital stenosis of the pylorus the prognosis in the absence of surgical interference is probably uniformly fatal. The average age at death in these cases, as given by Meltzer, is nine and one-half weeks. But it must be very difficult to distinguish these cases from the infantile form, in which Still (*Lancet*, 1905) says that typical cases with visible peristalsis and a hard, palpable pylorus recover completely under medical treatment and show no tendency to recurrence, and Bloch (*Jahrb. f. Kinderheilk.*, Berlin, 1907, lxv, 336) reports 8 cases cured and 2 that died under medical treatment.

Thus far it is probably, though not certainly, true that the cases that are submitted to surgical interference are the more severe cases of pyloric stenosis, and not only that, but they come to operation so late that the infants' vitality has been reduced nearly to the minimum. Thus, in the cases which I have collected and added to those already collected by Thompson, the average age at onset of symptoms was thirteen days, while the average age at operation was

fifty-two days. This certainly seems an unnecessarily long time to delay operation. The records of cases are extremely incomplete in many instances, but in those in which age was mentioned, the average age of those that died was fifty-seven days, and of those recovering thirty-four days, certainly a very decided difference in favor of earlier operations.

The following tables show the mortality in 114 cases, together with certain other facts bearing particularly upon the nature of the operation performed.

Operation.	Number.	Recovered.	Died.	Mortality. Per cent.
Divulsion	27	13	14	51.8
Gastro-enterostomy	69	32	37	53.6
Pyloroplasty	17	8	9	53.0
Pylorectomy	1	..	1	100.0
Total	114	53	61	53.5

This table shows practically little variation from the figures for 89 cases, given by Thompson; there has, however, been no reduction, but rather a rise in mortality in the last 25 cases reported.

	Mortality from Thompson's		
	89 cases. Per cent.	114 cases. Per cent.	Additional 25 cases. Per cent.
Divulsion	53	51.8	50
Gastro-enterostomy	51	53.6	70
Pyloroplasty	50	53.0	60
Pylorectomy	100	100.0	..

It is rather surprising that an operation seemingly so unsurgical in its method and so unpromising as to its permanency as divulsion should show the most favorable percentage of recoveries, and this cannot be due alone to the smaller number of cases, for in this class we have 27 cases, with a mortality of 51.8 per cent., while in pyloroplasty there are but 17 cases, with a mortality of 53 per cent. It seems to me that it tends to emphasize the probability of this pyloric stenosis being very frequently an acquired form, since the divulsion, though conceivably only temporary in character, might permit of so much improvement from medical and dietetic treatment as to

make the cure practically permanent and perfect, particularly if the hypertrophy were due to pyloric spasm.

Aside from the inherent dangers of operation upon the marasmic babes, the mortality from divulsion seems to have been due to (1) failure to overcome stenosis (insufficient dilatation); (2) rupture of pylorus through peritoneal coat; (3) hemorrhage.

Pyloroplasty, with a mortality slightly less than that of gastro-enterostomy, would apparently be the operation of choice, and would accomplish in the safest, easiest, and most correct manner the relief sought, and yet I can find but 17 cases in which this operation has been performed. There must evidently be some reason other than a preconceived preference for gastro-enterostomy to account for the small number of pyloroplastic operations, and this reason seems to me to lie in the fact that operators have considered the hard, thickened, elongated, cartilaginous feeling pylorus to be a barrier to its successful accomplishment. Dent has been an advocate of pyloroplasty, reporting 50 per cent. of recoveries in 14 cases, and seems to consider the technical difficulties practically negligible. He uses a single row of Halsted sutures, which simplifies the operation very materially. Cantley is of the same opinion, and says that if the muscle is very thick and hard a portion on each side can be snipped out before suturing. I must confess that in my own case I resorted to gastro-enterostomy because I could not conceive of its being physically possible to per form a successful plastic operation upon the hardened and thickened pylorus, and in the absence of further clinical experience I should not feel justified in attempting it should another similar case present itself, though in less aggravated cases it would probably prove a better operation than gastro-enterostomy.

In seeking the probable causes of death, as given in reported cases, we find marasmus and shock to be the principal factors, and one late death fifty-four days after operation from ileocolitis probably not dependent upon the operation.

Gastro-enterostomy has been performed in 69 reported cases of infantile pyloric stenosis, more than four times as often as pyloroplasty, and scarcely three times as often as divulsion. This dis-

proportion in figures would seem to confirm the thought that, to most operators, the chances of securing a successful result from a pyloroplasty have not seemed encouraging.

Whether the anastomosis was anterior or posterior has been omitted in the majority of cases, but in those in which this detail is mentioned the preponderance is slightly in favor of the posterior method. Obviously the button method is not a desirable one, and the suture has been resorted to in all but one case.

The anterior or posterior method will probably continue to be used, as the judgment or experience of the operator may decide. It seems to me that the anterior method could be resorted to with less handling of the stomach and intestines, with freer space for application of clamps, better control over possible complications entailing loss of blood during operation, and, therefore, less danger from shock.

The jejunum, as it appears when the abdomen is first opened, is so extremely small that the application of clamps would seem out of the question, yet upon manipulation and exposure, just as in the adult, it increases very markedly in diameter, and small curved clamp forceps covered with rubber tubing can be used for stomach and gut. This expedites the operation and reduces the hemorrhage to practically nothing, both important factors in lessening the death rate.

The principal causes of death following gastro-enterostomy in these cases have been shock, convulsions, prolapse of gut, and peritonitis.

If one would be entitled to draw any conclusions from this *resume*, they would be:

1. Congenital stenosis and infantile stenosis are of decidedly different clinical significance.

2. Congenital pyloric stenosis would in all cases call for very early operative interference.

3. Infantile pyloric stenosis develops after birth and is often amenable to medical treatment, but in the absence of improvement an early operation offers an excellent prospect of recovery.

4. There does not seem to be as yet any positive way to dis-

tinguish between the congenital and infantile forms. The earlier the symptoms, the more probable the congenital form.

5. In selected cases pyloroplasty offers results superior to those of gastro-enterostomy, and should be the operation of choice.

6. There has been no recent improvement in operative results.

7. The one great determining cause of death in practically all cases is delay, and it is obvious that until this obstacle is removed by the medical attendant, little or no improvement on the present statistics can be expected.

Bibliography.

C. E. Bloch. Jahrb. f. Kinderheilk., Berlin, 1907, lxv, 336–352, 477–501.
George Carpenter. Brit. Jour. Children's Dis., 1905, ii, 408, 512.
George Carpenter. Ibid., iii, 365.
George Carpenter. Rep. Soc. Study Dis. Children, London, 1906, vi, 27–34.
E. Cantley. Brit. Jour. Children's Dis., 1905, ii, 512.
E. Cantley. Brit. Med. Jour., London, 1906, ii, 939–942.
Louis Fischer. Arch. Pediat., 1906, xxiii, 341.
Frank Hartley. Ibid., 1907, xxiv, 207–214.
Hirschsprung. Jahrb. f. Kinderheilk., 1888, xxviii, 61.
Ibraheim. Brit. Jour. Children's Dis., 1906, iii, 364.
John W. Keefe. Providence Med. Jour., 1906, vii, 104.
R. R. Kimbal. Arch. Pediat., 1907, xxiv, 207–214.
John Lovett Morse. Boston Med. and Surg. Jour., 1906, clv, 343.
John C. Munro. Arch. Pediat., xxii, 727.
H. J. Patterson. Lancet, March 3, 1906.
C. P. Putnam. Brit. Med. Jour., London, 1906, ii, 945–948.
W. R. Ramsey. St. Paul Med. Jour., 1906, viii, 717–723.
J. W. Rob. Lancet, 1906, i, 1751.
John Rogers. Arch. Pediat., 1906, xxiii, 387.
Sarvanot. La Presse Méd., August, 1905, 536.
Sarvanot. Brit. Jour. Chil. Dis., 1906, iii, 124, 364.
Schmidt. Münch. med. Woch., 1905, ii, 308.
Chas. L. Scudder. Jour. Amer. Med. Assoc., xliv, 1665.
Chas. L. Scudder. Providence Med. Jour., 1906, vii, 84, 85.
Chas. L. Scudder. Vermont Med. Monthly, 1906, xii, 49.
Chas. L. Scudder. Boston Med. and Surg. Jour., 1907, clvii, 321.
H. J. Stiles. Brit. Med. Jour., 1906, 946–948.
Geo. F. Still. Lancet, 1905, i, 632–635.
A. Sturmdorf. Arch. Pediat., 1906, 388.
Geo. F. Thompson. Surg., Gyn., and Obs., 1906, iii, 521.
O. N. Torian. Indiana Med. Jour., August, 1907.
Wachenheim. Am. Jour. Med. Sci., 1905, cxxix, 636.
Williamson. London and Edinburgh Monthly Jour. of Med. Sci., 1841, 23.

DISCUSSION ON THE PAPERS OF DRS. MOYNIHAN, MAYO, DEAVER, RODMAN, ROBERTS, AND BUNTS.

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It may be of interest to speak of some complications following operations for stenosis of the pylorus, and of the possible overcoming of these.

I had a patient with a benign pyloric stricture, who passed on the third day of convalescence, after gastro-enterostomy (short loop suture), into a deep coma, passing the stools and urine in bed. There was no reason for the condition so far as her temperature and pulse were concerned. It seemed to be a case of profound toxemia, as we sometimes see it in operations for cirrhosis of the liver, etc. We could feed the patient only by the rectum. Regularly every eight hours we gave besides, a hypodermoclysis of saline solution, using a quart and one-half; five days later she regained consciousness and passed into proper convalescence. Lately, at one of the meetings of the New York Surgical Society, Dr. Gerster referred to a similar case, in which he attributed the cause to inanition. He fed his patient by the stomach tube, and the patient got better.

Further, I have found, after a comparatively normal convalescence, bloody vomit in large masses on the third day. I could not explain it because there had been no bleeding in the beginning, and the continuous suture had been made very carefully. We thought acute dilatation might be the cause, and washed out the stomach and introduced two ounces of bismuth mixed with some water, which Kussmaul has advised in bleeding ulcer of the stomach; then resorting to rectal feeding and keeping the stomach empty for several days. I have arrested the hemorrhage in 2 cases in this way.

In view of the eventual necessity of adding entero-enterostomy to gastro-enterostomy, it may probably be deemed advisable, after further observation, not to take the loop of intestine for anastomosis too short. If, then, additional operating should become imperative, entero-enterostomy would be feasible. Personally he had seen the smoothest and undisturbed permanent recoveries after operations with the long loop, plus entero-enterostomy. Were it not for the absolute necessity of adding this last operation in such cases, he would favor the long-loop operation.

DR. JOHN H. GIBBON, of Philadelphia.

The absence of any mention of peptic ulcer of the jejunum as a sequel to gastro-enterostomy, in a report of over 1000 cases, has occurred to me

as unusual. We have always been led to believe that peptic ulcer of the jejunum was an occasional sequence of gastro-enterostomy. In a comparatively small experience I have found it on one occasion. I should like to ask the experience of the Fellows as to the occurrence of this condition and its frequency after gastro-enterostomy.

Dr. George W. Crile, of Cleveland.

I should like to speak of the usefulness of a direct transfusion of blood during the time that operation is performed. This has been extremely useful in one case in rendering an unsurgical case surgical.

After listening to this discussion, we are confirmed in the opinion that chronic gastric ulcer is frequently followed by cancer. The symptoms of ulcer may be regarded as a warning against cancer. Cancer in its incipiency, as Park has emphasized, is without clinical symptoms.

We have made observations on 66 cases of cancer with regard to the hemolytic test. The test is still in the tentative stage, but of 66 cases, 80 per cent. gave positive reaction, and the test was proved correct by autopsy or by operation. The test is most active in the early stage of the disease.

Dr. J. M. T. Finney, of Baltimore.

Since 1905, when I reported before this Association a method of pyloroplasty, I have had occasion to use that operation forty-eight times. Of these cases, 4 have died. In all we secured autopsy, and the autopsy showed the cause of death other than anything traceable to the operation itself. However, it would be unfair to class it other than a mortality of 4 cases in the list.

I have tried in a recent publication to express my belief that the objections originally argued against gastro-enterostomy do not hold, as the operation is employed in abdominal operations in the best clinics today. Since the operation has been done so many times, and the cases have been under observation for so long a time, it seems to me there is no reason to anticipate untoward results that have not yet manifested themselves. Therefore, it seems to me that the personal equation is a determining factor in the question. One operator does one operation more easily than another. Personally I can get better results with the pyloroplasty. In no case of pyloric obstruction have I found contra-indications preventing me from using it. I have not the exact figures, but, except in a few nervous cases, the results have been entirely satisfactory.

I endorse all that Dr. Rodman said in urging resection in doubtful cases of ulcer. In connection with Dr. Friedenwald, of Baltimore, I have treated 2 cases, and I have had 3 others in which it was impossible to make a diagnosis between ulcer and cancer by either the gross speci-

men or the frozen section. The microscopic examination was satisfactory only after the section had been stained.

Dr. Roberts referred to a case of mine in which gastric hemorrhage followed removal of the Gasserian ganglion. I have seen it in one other case, but I have no explanation to offer.

Pyloroplasty in inflammatory pyloric stenosis, it seems to me, is not indicated, but definitely *contra-indicated*, because the conditions of the pylorus are such that it would be very difficult to get a satisfactory result; that is one of the cases in which, in my judgment, gastro-enterostomy ought to be employed.

Dr. John C. Munro, of Boston.

A year ago, at the Congress in Washington, we reported our cases of all types. In reporting today on the cases which were definitely gross ulcers, and which left the hospital well two or more years ago, we find that we have had some 69 altogether. Less than 20 per cent. have been failures. All the cases can be grouped under the long loop, double loop, or short loop. A difference in our results can be definitely traced to the difference in technique. For two years or more we have employed almost entirely the short loop or the Finney operation. Of the 69 cases we consider that 8 were failures. One developed cancer two years after operation, unless it was cancer at the time of operation. Another patient continues to have some pain. One duodenal ulcer case, which had a Roux operation, died of sudden hemorrhage a year after operation, possibly because of a peptic ulcer, as Dr. Gibbon has suggested. Another patient has vomiting and loss of weight, but whether there is beginning carcinoma or not I do not know. In one patient, in whom a posterior short-loop operation was done, there was temporary bleeding three years after operation, but the patient recovered. We estimate that about 80 per cent. have been cured or made so well that nothing better could be desired. Dr. Meyer, if I understand him correctly, appeals for the long loop, so that an entero-anastomosis can be done afterward if needed. Our results have been so good with the no-loop method that nothing could induce us to go back to the long loop.

We have had 5 cases of congenital stenosis; 2 recovered after gastro-enterostomy. In no one of our cases could pyloroplasty have been done, as the tumors were solid and the orifice would not admit a probe.

I believe, as has been said, that there are many more cases of infantile congenital stenosis than the pediatrists realize, and if they will bring them to us earlier we can cure them.

Dr. Charles L. Gibson, of New York.

I should like to ask whether in these long series of cases there were any observations regarding the effect of the operation in reducing the

total acidity of the stomach contents, and whether those cases considered failures showed a continuation of this high acidity.

Dr. John C. Oliver, of Cincinnati.

Within the past two years I know of 4 cases of congenital stenosis operated upon by gastro-enterostomy in Cincinnati. Two were under my care and 2 were under the care of my colleagues. Two recovered and 2 have died. The first case of my own occurred in a female infant, the symptoms becoming evident when it was about two weeks old. There was a distinct family history of stomach trouble back for three generations. The mother and grandmother of the child had had stomach trouble. I do not know whether these conditions were obstructive in nature. Another interesting fact was that the mother of the child, during the time she was carrying it, developed tuberculosis of the glands at the root of the neck on the right side. These broke down, ulcerated, and were curetted.

The character of the operation upon this infant was decided for us by the utter impossibility of doing a pyloroplasty. When the abdomen of the child was opened the mesenteric glands showed an early stage of tuberculosis. This occurring in connection with the other condition was a very interesting point.

The second case was a male infant, and the operation was done at about the fourth week. The symptoms developed at about the third week. This second case had the misfortune on the tenth day to have a stitch cut out through the abdominal wall, and when the dressings were changed quite an amount of the intestines was out in the dressings. A secondary suture of the wall was made and the child went on to recovery. There is a difference of opinion regarding the operation best suited to relieve this condition. Dr. Cantley and Mr. Dent, who have reported more cases of this kind than any other observers, favor pyloroplasty. The mortality after pyloroplasty and gastrojejunostomy is about the same, 50 per cent., so there is probably not much choice between the two operative measures.

Dr. Francis J. Shepherd, of Montreal.

I have done 1 case of pyloroplasty in a child who, a week after birth, began to vomit and emaciate. It would fill its stomach with one or two feedings and then expel everything forcibly out of the mouth. At the third week I made an inch incision in the median line above the umbilicus, pulled out the stomach, and did a pyloroplasty, although it has been said today to be impossible. I do not think a more typical case than this could have occurred. The ring of hypertrophied tissue could be felt through the abdominal wall. I made an incision of some length

through the stomach and duodenum and then cut away a large part of the pyloric muscle to enable me to bring the edges together, and also a good deal of the mucous membrane, which hung down on each side of the incision. One reason that pyloroplasty is objected to is that a day or two after the operation the mucous membrane swells up; so I took the precaution to cut the mucous membrane away. Also, it is objected that the infolding of the tissues blocks up the opening, but if only one row of sutures is used this does not occur. There were no bad results. The child is now eighteen months old, there have been no alarming symptoms, and the child is in perfect health. In this case a probe could not be passed through the pylorus.

Dr. Leonard Freeman, of Denver, Col.

In a series of gastro-enterostomies I used linen thread for the first or hemostatic suture, and had but one hemorrhage, which was explained by a defect in the technique. I then began to use chromic catgut. Quite a number of cases went nicely, and then came a case of extreme hemorrhage. In the next operation I was extremely careful, but again there was bleeding, and also in the next one. Then, in a case in which it was necessary to do a secondary operation, I had not only hemorrhage during the first operation but also during the second. I then became alarmed. Inquiry into the cause of the difficulty showed that, according to advice given the operating-room nurse, the catgut had been chromicized much less than usually. Experiments were made to ascertain how long it would last, and, although it was supposed to last for forty days, it lasted but a few days. I also found that I had been using much smaller gut than usual. I then discarded catgut and returned to the linen thread. Since that time there have been no hemorrhages. Hence I deem it important from time to time to look into the character of the catgut, if that form of suture material is used.

Dr. Meyer, of New York.

I do not wish to be understood as believing that we should return to the long loop; but, in view of the fact that a vicious circle may occur, we should not make the loop too short. I think the short loop, with the help of the suture, is the operation of choice.

Dr. John E. Summers, Jr., of Omaha, Neb.

In regard to postoperative hemorrhage, gastric and intestinal, Dr. Roberts referred to hemorrhage from the colon following nephrectomy. I have had 5 cases of postoperative, gastric, and intestinal hemorrhage; 1 of these was from the descending colon following a nephrotomy. It seems to me that in every case trauma can be found as the basis of the

hemorrhage. The experimental work of Litton, Schnitzler, Kukula, and others proves conclusively that trauma is the cause, trauma either to the mesentery or to the omentum. When the hemorrhage occurs early, the site of the trauma is close to the origin of hemorrhage; when late it is more distant.

MR. MOYNIHAN, of Leeds, England.

When I first had the honor to appear before the American Surgical Association, the surgery of the stomach was in its infancy. Today it is a thriving, full-grown child. I find the greatest difficulty in the differential diagnosis between the cases where the symptoms of ulcer are mimicked accurately by some other disease, possibly of the functional type, and those cases in which duodenal or gastric organic disease is present. There are cases in which, when I have opened the abdomen, expecting to find organic disease, I have found a perfectly healthy stomach. In all such cases it is our business to close the abdomen, to acknowledge that we have made a mistake, and let the matter end there. When, however, a genuine organic disease of a structural character is exposed, the kind of operation we are to practise should depend upon the conditions found. If there is an ulcer at or near the pylorus, I do not think there is any doubt but that the operation of gastro-enterostomy ought to be performed. I do the posterior, no-loop operation, making the anastomosis as close to the flexure as I can.

The direction of the jejunum is a matter upon which Dr. Mayo and I agree to differ. The point is not so much as to whether the jejunum should go vertically or slightly to the right or left, but that it should be applied to the stomach in such a way that it lies easily. There should be no rotation of the gut in its longitudinal diameter at the time the attachment of the bowel to the stomach is made.

If there is any mimicry so close that one cannot distinguish with certainty between chronic ulcer and carcinoma, the ulcer should be excised wherever it lies. If it lies up on the lesser curvature, I should like to be present when the most distinguished surgeon is attacking that case. I have excised a good number, and I am bound to say that the operation is always entered upon with a certain amount of misgiving. The difficulties may be extremely great, but not insurmountable; and difficulties are, after all, the things which the surgeon always delights in.

I have had but 1 case of regurgitant vomiting of bile in the last four years, and I was conscious at the time of operation that I had not done the operation well. I feel quite confident that postoperative regurgitant vomiting of bile is due to a mechanical defect at the time of the operation.

A serious matter, which I think surgeons will have to confront, is the occurrence of peptic ulcer of the jejunum. I was interested in Dr.

Gibbon's comment that in all the cases mentioned there had been no case recorded of peptic ulcer. In the cases mentioned in my paper I have not had a case of peptic ulcer, but in a case in which I did a posterior gastro-enterostomy, a year ago last January, the patient died on the eleventh day from perforation of a jejunal ulcer. Altogether I have collected, and shall probably publish, 60 cases of peptic jejunal ulcer. I think that is the only complication that remains of gastro-enterostomy likely to be at all serious.

We should endeavor by every means at our command to separate mimicry patients and those with genuine organic disease. Having discovered the organic lesion, we know exactly the kind of measure to be adopted in each particular case.

Dr. Mayo, of Rochester, Minn.

I think the one thing that has been brought out is that we can secure not less than 80 per cent. of permanent recoveries in that particular group of gastric ulcers in which the medical treatment has failed, and, in addition, something less than 10 per cent. will be improved. It has also been shown that the real difficulty has been our inability at the operating table to be sure that an ulcer actually existed. The evidence must be such as to satisfy people at a considerable distance from the operating table, and if there is doubt as to the existence of ulcer it is the surgeon's duty to open the stomach and see if an ulcer is really present before doing an operation for it.

It has, I think, been further shown that the difficulty with the cases about the country that have had gastro-enterostomies made and are much worse as a result does not lie in the inability of the operation to cure, but in the fact that the medical diagnosis has not been confirmed at the operating table and that the operation has been done upon cases in which it should not have been. Thereupon we find the internist saying that the cases are worse as a result of operation instead of recognizing the mistake in diagnosis.

We have performed the Rodman operation over twenty times, and it has frequently happened that in an operation which we expected to be for simple ulcer, the condition found showed that the ulcer had already become carcinomatous.

The surgeon has been asking too much of the practitioner in asking him to turn the cases of gastric cancer over for operation early. The diagnosis cannot be made sufficiently early, as a rule. Let us ask him, rather, to turn over to us the cases of tumor and pyloric obstructions, because in many of the cases that come to us for operation the internist has been feeling of tumors, examining them day after day, and believes, on account of certain tests—which tests, I agree with Dr. Rodman, are

often valueless—he can determine whether the tumors are ulcer or cancer. Then he turns over to us a tumor which he has felt for two and one-half months, and has satisfied himself is cancer, and expects us to cure it. Neither do I believe that medicine can permanently relieve mechanical obstructions. If the practitioner will turn over tumors and obstructions at once, surgery will do better than medicine if they are not malignant, and if they are malignant it will put in our hands a considerable percentage of malignant diseases of the stomach in time to cure them.

Dr. Rodman, of Philadelphia.

I was much interested in the paper of Dr. Roberts, and also in the discussion of that paper by Dr. Summers. I do not think that postoperative hematemesis is due to trauma. In 1900 I made a number of observations on dogs where the mesentery was actually twisted. The stomach was cut into, and there was not the slightest capillary hemorrhage of any kind. I communicated with a number of surgeons who had done herniotomies, and none of them had seen postoperative hematemesis in these operations. In a large number of cases, in which I had resected the omentum, we got no postoperative hematemesis. It is rather difficult to explain why postoperative hematemesis does occur, but I am confident that it does not occur as the result of trauma in the abdomen. It seems to me that, as Dr. Roberts has said, the most rational explanation is that it is due to sepsis of some kind.

I was much interested in Dr. Freeman's remarks concerning hemorrhage after gastro-enterostomies. I have used Pagenstecher's suture for the inner stitch, but am now inclined to question whether it is the proper suture. Following a recent gastro-enterostomy, the patient was going everywhere and doing well, when there was a furious hemorrhage. At one time there was copious vomiting, with a large clot, and in the clot was the Pagenstecher suture. I believe that the well-chromicized gut is, perhaps, the better suture, because after a suture has been in place ten days it ought to have done all the good it can, and after that it becomes a menace to the security of the patient. In this case I was able to arrest the hemorrhage when I had almost despaired of everything by putting into the stomach water at a temperature of 120°. So it is questionable whether it is better to use a well-chromicized gut or the Pagenstecher suture. I can well understand how the suture, which came up in my case, might go down and cause trouble in the bowel.

I am much gratified to find the views I have expressed endorsed by such distinguished authorities as Mr. Moynihan and Drs. Mayo and Finney. It seems to me that we must come to a more radical treatment of gastric ulcers. That gastro-enterostomy will be possibly the operation

of choice in the majority of instances goes without saying, because it is easier of execution and can be done more quickly in certain instances. Yet we know that it fails to remove the lesion, that it does not prevent stenosis, and that it fails to prevent hour-glass contraction. If the lesion can be relieved, and the function of the stomach improved by subsequent operative procedures, this should be done. There is no question that there will be an increased mortality following pylorectomy over simple gastro-enterostomy. In a large number of pylorectomies for ulcer, practically all reported the mortality was well within 7 per cent. So I insist that an operation that can be done with a slight increase of mortality over gastro-enterostomy, and the benefits of which are more permanent, abiding, and satisfactory in every way, not only concerning the function of the stomach, but the safety of the patient, is certainly justifiable. The increased risk amounts to practically nothing. We should keep constantly before us the danger of cancer of the stomach, remembering that 35 per cent. of all carcinomata of the body are in the stomach and 80 per cent. of those are at the pylorus.

STONE, TUBERCULOSIS OF THE KIDNEY, AND PERINEPHRIC ABSCESS.

By GEORGE TULLY VAUGHAN, M.D.,
WASHINGTON, D. C.

Stone may exist in the kidney or ureter without infection, although it is probable that infection occurs sooner or later in the large majority of cases; and infection, tuberculous or septic, may, and probably in the majority of cases does, occur without the presence of stone. Either of these factors may act as the causative agent of the other—pus, blood clot, or bacteria may form the nucleus or furnish the colloid material for building up a stone; a stone by wounding or irritating the tissues about it may furnish the atrium of entrance or produce the locus minoris resistentiæ for pathogenic organisms.

Thus, we often get stone and suppuration together. Beyond what has been stated, and the belief that the urinary salts are deposited in excess because there is a lack of balance between ingestion and assimilation, ingestion of too much nitrogenous food with too little exercise and imperfect oxidation of the nitrogenous products, little definite is known as to the etiology of calculus. Heredity seems to be important. It is claimed that sudden chilling of the body may cause precipitation of the solid material from a saturated urine in the renal tubuli, forming a calculus in the parenchyma, or, being washed farther on, it forms the nucleus of a stone in the pelvis of the kidney. According to the size of the particles, the precipitate is known as sand, gravel, or stone. The composition is uric acid, urates, calcium oxalate, calcium carbonate, ammoniomagnesium phosphate, and rarely cystin or xanthin.

Primary calculi are usually composed of uric acid and oxalate

of calcium, one or both, and are found in acid urine; secondary calculi are composed of phosphate and carbonate of calcium and phosphate of magnesium usually deposited on a nucleus composed of a primary stone or of mucus, pus, blood clot, hair, or other foreign matter, in alkaline urine.

Symptoms. The symptoms of stone in the kidney are caused by infection or the mechanical action of the stone; hence, if there is no infection and if the stone is situated so as not to produce obstruction or laceration, there will be no symptoms. The most reliable symptoms are pain, renal colic, the presence of blood, pus, or gravel in the urine, and oliguria or symptoms of suppression of urine. The pain is usually felt in the lumbar region of the affected side, and may be aggravated by motion. It may extend along the ureter to the bladder, testicle, penis, thigh, foot, and may be referred to the sound kidney. Palpation or percussion over the kidney may cause pain. Often the first sign of calculus is an attack of renal colic caused by the stone blocking or travelling along the ureter, characterized by excruciating pain along the ureter, and often into the testicle and inner side of the thigh, frequent micturition with a little blood in the urine, vomiting, and sometimes chill and fever.

If the symptoms end suddenly, the stone has either dropped back into the kidney pelvis or has completed its journey to the bladder, and careful examination of the urine should be made for two or three weeks, or the bladder may be cystoscoped for the stone.

If, instead of suddenly ceasing, the symptoms of renal colic merely subside to a subacute condition, it means impaction of the calculus in the ureter, and if it continues beyond twenty-four hours there is likely to be fever, and pus may be formed in the urine. The point of impaction in the ureter may often be determined by the location of the greatest pain and tenderness. Statistics would indicate that the most frequent site of lodgement is the juxtavesical portion; next, the juxtapelvic; and last, the portion at the brim of the bony pelvis. Sometimes the ureter is so completely blocked by the calculus that nothing passes through it to the bladder; then it is that cystoscopy and ureteral catheterization are of the greatest

value; also the use of the Röntgen ray, especially when the symptoms have been referred to both kidneys.

The retention of the stone in the kidney leads to infection and to various destructive changes in the organ—most frequently perhaps to pyelitis or pyonephrosis—sometimes to hydronephrosis and to pyelonephritis. The symptoms of renal calculus in the absence of renal colic are pain in the lumbar region, which varies in character and severity, often a dull heavy ache, which may be aggravated by stooping, bending, or jarring. There are frequent micturition, pyuria, tenderness on palpating the affected kidney, and sometimes an appreciable enlargement of the kidney. Casper and others use phloridzin and cryoscopy in order to test the functional activity of the kidneys and to compare one kidney with the other. Phloridzin, gram 0.01, injected under the skin, produces diabetes, which lasts about three hours. If one kidney is crippled by reason of a stone, tuberculosis, or other causes, the urine from that kidney shows a smaller amount of sugar than the urine from the healthy kidney. Also, on freezing the urine collected from the two kidneys separately, it is found that the urine from the crippled kidney contains less solid matter in solution, and therefore freezes at a higher temperature (less degree of cold) than that from the healthy kidney.

If the disease last long, constitutional symptoms, fever, chills, and loss of flesh come on.

TUBERCULOSIS OF THE KIDNEY.

The consensus of opinion today is that tuberculosis of the kidney is, as a rule, of hematogenous origin and often unilateral, being primary in the kidney in about 15 per cent. of cases (Watson, Tuffier, quoted by Walker) and secondary in the majority of cases to tuberculous foci in other parts of the body, as the bronchial and lumbar glands (Walker). Very rarely it is secondary to tuberculosis of the bladder. Sometimes the organ is invaded from an adjacent tuberculous vertebra.

It seems that injury of the kidney, as by blows or the presence

of stone, and the various inflammations, including gonorrheal, predispose to the occurrence of tuberculosis; the age during which most patients are affected is from twenty to forty-five, but the limits are from three months to seventy years; as to sex, women slightly predominate; and the right kidney suffers more frequently than the left. The ureter is said to be affected in 10 or 12 per cent. of cases. The sound kidney is usually enlarged by hypertrophy. The tissues surrounding the kidney are not infrequently involved, and perinephric abscess may result.

Symptoms. These may be frank or insidious, and may be divided into urinary, vesical, renal, and general.

Urinary Symptoms. The first symptom is usually polyuria, which may last a month or so, with no change in the composition of the urine except that it is low in specific gravity. Blood and pus soon appear—the former usually intermittent and in small quantity, requiring a microscope for its detection; at other times the quantity may be considerable.

Pus may be small in quantity, but is usually found early and in abundance, often forming a large precipitate up to one-half the urine by volume. Crumbling caseous particles occur in the urine, and in them tubercle bacilli are often found. Tubercle bacilli are found in the urine in 70 to 80 per cent. of cases if careful examination is made (Casper). The phloridzin and cryoscopy tests are valuable.

Vesical Symptoms. Frequent and painful micturition is nearly always present, the frequency varying from every two or three hours to every ten or fifteen minutes, night and day, and the pain from a slight uneasy sensation to one of severe burning and tenesmus. These symptoms are not due to tuberculous ulcers in the bladder, but simply to irritation from tuberculous urine. The cystoscope shows injection of the bladder mucous membrane, and especially a red inflamed elevation around the mouth of the ureter on the affected side, occasionally tuberculous ulcers near the ureteral mouth.

Renal Symptoms. Rarely no pain is felt in the region of the kidney. Usually there is pain of a dull, aching, or sharp lancinating

character, intermittent or almost continuous, sometimes radiating to the groin, testicle, penis, or umbilicus, or even to the shoulder. In perhaps 30 per cent. of cases a mass can be felt, and in the majority there is tenderness on deep pressure; occasionally the thickened ureter can be recognized by palpation.

General Symptoms. There are chills, fever, sweats, loss of flesh, vomiting, and uremia. The fever is seldom noticed as an early symptom, later it is well marked, may be irregular, intermittent, moderate, high, and associated with chills or chilly sensations and profuse sweats. The pulse corresponds. Anorexia, indigestion, anemia, and loss of flesh soon follow and a cachexia is established. Uremia usually means that both kidneys have been invaded.

The course of the disease varies, death may result within a few months or a year after its inception, or it may be much longer delayed, and the patient may have fairly good health for several years.

PERINEPHRIC ABSCESS.

Perinephric abscess is the result of infection of the tisuses immediately surrounding the kidney. Casper makes three divisions, namely, peri-, epi-, and paranephritis—the first meaning inflammation of the fibrous capsule; the second, that of the fatty capsule; and the third, that of the retroperitoneal mass of fat behind the kidney. Usually it is not possible to differentiate between them, and the term perinephric abscess is used here to mean a collection of pus in the fat surrounding or adjacent to the kidney—so often of doubtful origin and difficult of explanation.

The abscess may be *primary*, as the result of traumatism or of hematogenous infection; but far more frequently it is *secondary* to some infection of the kidney or other organ, such as the appendix, gall-bladder, spleen, lung, pleura, bones, prostate, bladder, or rectum. As it is sometimes impossible to discover any other primary focus, it is thought that infection may take place through the unbroken walls of the colon. The affection is more frequent in

men and on the right side, but is occasionally bilateral. The abscess may be single or multiple, and the pus may be odorless or it may have a fecal or urinous odor. The abscess may be partly within and partly without the kidney, and is usually behind that organ, but may be above, below, or in front of it. The pus may burrow in any direction—behind the peritoneum and break into the rectum, bladder, vagina, urethra, kidney, or ureter; it may follow the iliac vessels to Poupart's ligament, or pass through the sacrosciatic foramen and point in the gluteal region; it may break into the stomach, liver, intestine, pericardium, or peritoneal cavity; but the most common places for pointing are in the lumbar region (Pettit's triangle) and the pleural cavity (White and Martin).

Symptoms. Pain, tenderness, chill, fever, and a palpable mass are the chief symptoms. Pain is felt in the loin and is aggravated by pressure or motion, so that the muscles are contracted in such a way as to diminish pressure and prevent motion; thus, the patient lies on his back with the thigh flexed and adducted and the spine flexed with the cavity toward the affected side. Pain may be felt along the ureter, in the genitalia, the inner side of the thigh or the foot, and the latter may show edema or swelling. The area of dulness in the loin is increased, and a tender, irregular, diffused mass, fixed and motionless on respiration, is felt. Edema and fluctuation may be present. The urine may contain pus when the kidney is sound if the abscess communicates with the ureter. (See Case II.)

Other symptoms may be sweating, vomiting, anorexia, and leukocytosis.

The Röntgen ray may show a stone in the kidney; its negative evidence is not always reliable. The tuberculin test may establish the presence of tuberculosis.

Treatment. A stone in the kidney should be removed as soon as possible, whether or not it is causing trouble, as trouble would inevitably occur in time, and the safest time for removal is before infection or inflammation sets in. A stone impacted in the ureter should be removed after a reasonable delay to see if it is able to reach the bladder. Reasonable delay cannot be exactly given in

time as it depends on the symptoms and circumstances. As a rule, forty-eight hours is long enough to wait, but sometimes it may be advisable to wait a week. The longer the delay, the greater the danger of damage to the kidney and ureter.

DIFFERENTIAL DIAGNOSIS BETWEEN STONE IN THE KIDNEY, TUBERCULOSIS OF THE KIDNEY, AND PERINEPHRIC ABSCESS.

	Stone in the kidney.	Tuberculosis of the kidney.	Perinephric abscess.
Pain	Dull, aching, burning, sharp, lancinating, intermittent. Renal colic common.	Dull, aching, more apt to be continuous. Renal colic rare.	Dull, aching, continuous. Renal colic rare.
Tenderness . .	Usually present.	Well marked.	Well marked.
Mass or tumor .	Seldom felt.	Often felt, defined and movable with respiration.	Usually felt, irregular, not moving with respiration.
Hematuria . .	Occurs early, intermittent, small quantity.	Occurs early, small quantity—may be large.	Not present.
Polyuria . . .	No.	In earliest stage.	No.
Pyuria . . .	Intermittent, may not be present.	Nearly always present in abundance.	Sometimes present.
Micturition . .	Frequent.	Frequent.	Often not affected.
Cystoscopy and ureteral catheterization . .	Perhaps pus or blood from ureter. Stone may be felt with ureteral bougie.	Pus from one or both ureters, ulceration of bladder or cystitis.	May be negative unless secondary to kidney disease, or abscess communicates with ureter. May follow either of the other diseases.

To prevent the occurrence of stone in the kidney after operation is a great desideratum. The use of the drainage tube until all infection has disappeared is important. The diet and habits of the patient should be regulated in order to get the proper adjustment between ingestion and assimilation. Alkaline salts, lithium

citrate and acetate for uric acid stone, and oxalic acid for phosphate stone, are used.

The question often comes up as to the propriety of removing a kidney which has continued to reproduce calculi. This should not be done as long as there is any hope of saving the kidney. In cases where the kidney has been destroyed and only a pus sac remains, and in pyelonephritis with multiple abscesses and continued suppuration in spite of treatment, nephrectomy is advisable.

Tuberculosis of the kidney, if recognized when it is limited to one kidney, should be treated by nephrectomy. If the ureter is affected, it should be removed with the kidney. The best incision for nephrectomy or nephrotomy is the Morris incision passing obliquely downward and forward between the last rib and crest of the ilium. It may be continued on to a point just above the external abdominal ring when it is necessary to expose the ureter as far as, and part way into, the pelvis. For calculi impacted in the vesical portion of the ureter, the mouth of the ureter may be dilated or cut from within the bladder through speculum or cystoscope or suprapubic section. Stone in the juxtavesical portion of the ureter in the female may be removed through the vagina, or in the male by an incision through the posterior part of the ischiorectal fossa (Rigby, *Annals of Surgery*, November, 1907).

If both kidneys are tuberculous and suppurating, nephrostomy and free drainage should be provided. Proper hygienic and climatic treatment are, of course, essential.

Perinephric abscess should be treated by incision and drainage as soon as possible, and the origin should be ascertained and treated appropriately.

Below are reported a few selected cases illustrative of the conditions discussed:

Case I.—*Patent urachus; stones in both kidneys; four operations within two years and a half.* This was a healthy-looking man, aged forty years, who was operated on June 25, 1904, for patent urachus, the urachus being dissected out down to the bladder. About six years previous to this operation the patient began to have attacks suggesting stone in the right kidney, and a

little later pain began to occur in the left kidney. He had several attacks of severe pain in the region of the kidneys, sometimes renal colic. Two months after recovery from the operation on the urachus he was taken with severe pain in the right loin, extending along the course of the ureter, bloody purulent urine, chill, vomiting, delirium; pulse, 120 to 140; temperature, 104°; face and feet slightly swollen.

The right kidney was exposed and opened from its convex border to the pelvis, evacuating urine and pus and removing a round, smooth, dark brown calculus about 13 mm. in diameter (see Fig. 1). The kidney pelvis was considerably dilated, evidently

13.5 mm.

FIG. 1.—Stone removed from right kidney, August 21, 1904.

15 mm. 12 mm.

FIG. 2.—Stones from left kidney, May 1, 1905.

from obstruction by the stone, but no abscesses in the parenchyma were found. A rubber tube for drainage was fastened in the kidney. Recovery in one month, and no further trouble until February, 1905, when he had an attack of renal colic on the left side and passed several small calculi. A month later he had a similar attack with chill, fever (106°), oliguria, and delirium, from which he soon recovered. Examination in April, about a month after this attack, showed hardness and tenderness in the region of the left kidney, and operation was recommended and performed May 1, 1905, using the oblique incision and removing the twelfth rib, as it was in the way (see Fig. 3). Before opening the kidney two stones could be felt in the lower part of the organ. Incision through the convex

border to the pelvis was made and the two stones removed from two separate calices or infundibula (see Fig. 2). Other small fragments were felt, and one was removed and the parts irrigated with salt solution, in the hope of washing the fragments out. There was no obstruction at that time, the kidney was about normal in size, but much congested, and no pus or urine was found. The wound in the kidney was closed with catgut around a rubber drainage tube. The tube was worn about four weeks, and recovery seemed complete in six weeks, the patient regaining his appetite, weight, and general feeling of comfort. There was no further trouble for a year, when, in June, 1906, he was taken with pain in

FIG. 3.—Stones from left kidney, December 6, 1906.

FIG. 4.—Bone in box.

the left hip and loin, chills, fever—those symptoms lasting some time; no typical attack of renal colic. Four months later the symptoms returned with considerable pyuria, and December 6, 1906, the left kidney was again operated on. The abscess in the kidney had just reached the surface by a small opening in the lumbar region. The kidney was exposed at a depth of three inches from the skin, opened, and fully 500 c.c. of thick creamy pus evacuated. The pelvis and calices were much dilated, and a large coral calculus was removed in fragments (see Fig. 4). Strong adhesions existed everywhere. The cavity was irrigated with salt solution, and two rubber tubes were sewed in place. The patient recovered with

his usual promptness, and by the end of January, 1907, had gained twenty pounds in weight and seemed in perfect health. There has been no further trouble up to this time, sixteen months after the last operation.

Remarks. The number of operations in a short space of time is unusual and the promptness and facility with which the patient recovered from every operation remarkable. The history may be summed up thus:

First operation, June, 1904, excision of patent urachus.

Second operation, August, 1904, stone removed from right kidney.

Third operation, May, 1905, two stones removed from left kidney.

Fourth operation, December, 1906, coral stone removed from left kidney.

It is probable that the urachus became infected through the bladder from the kidneys, and it was this leakage of foul-smelling urine and pus from his navel that induced the patient to have the urachus excised. The right kidney seems to have been first affected with stone. At the operation only one stone was found, it was removed, and this kidney has given rise to no further symptoms for nearly four years. On the other hand, the left kidney when first operated on contained some fragments, and it is not certain that all were removed. This may account for the recurrence of stone and pus requiring a second operation on the left kidney in about eighteen months after the first.

Case II.—*Enormous stone in the juxtavesical portion of the right ureter; a small stone in the vesical portion; a large perinephric abscess draining into the ureter.* A woman, aged thirty-three years, was referred to me by Dr. S. L. Owens, and was admitted to Georgetown University Hospital with the following history: Three years before she had been operated on for stone in the right ureter by a median abdominal incision, and made a good recovery. Had articular rheumatism January, 1907, affecting knees, ankles, and tarsal joints, and lasting about a month. Her present trouble began about one month ago with an attack of renal colic on the right side.

At first the pain was sharp and intermittent. After a few days it became continuous, less severe, but with exacerbations, requiring morphine frequently. These symptoms, with frequent urination, chills, fever, and blood and pus in the urine, have continued to the present time.

Examination shows rigidity of muscles and tenderness over the right side of the abdomen. By vagina a hard mass about as large as a hen's egg could be felt anterior and to the right of the cervix uteri, and was thought to be a stone in the ureter or just outside of the ureter. An incision was made in the vagina and a large stone removed from the ureter (see Fig. 5).

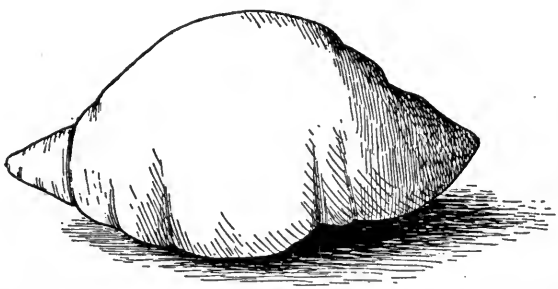

FIG. 5.—Stone from right ureter bladder end of Mrs. S., November 4, 1907. Weight, 915 grains; length, $2\frac{3}{4}$ inches; circumference, $4\frac{1}{2}$ inches.

The removal of the stone was followed by the discharge of a quantity of foul-smelling pus and urine. The ureter was much dilated, and admitted the passage of a large bougie, No. 20, as far as the brim of the pelvis. There was free discharge of urine and pus and the patient did well for a week, when pain in the region of the right kidney became troublesome, a continual dull aching pain, and the temperature and pulse rose again. The urine from the bladder was clear; that from the ureterovaginal fistula contained pus in abundance. Pyelitis or pyelonephritis was thought to exist, with obstruction of the lower end of the ureter, and it was decided to open the kidney and explore the ureter. A sound passed into the bladder readily detected a stone in the mouth of the right ureter. This was removed by passing the little finger of one hand into the bladder through the urethra and two fingers of the other hand into

the vagina. By this means the little stone was worked into the bladder and then out through the urethra. The stone is represented in Fig. 5 as the sharp-pointed fragment attached to one end of the large stone.

An oblique incision was then made to expose the kidney, when a large abscess, capacity about 750 c.c., was opened. The abscess was situated above and behind the kidney, and the latter had been displaced downward until its upper pole corresponded with the middle of the space between the last rib and the crest of the ilium. No communication could be found with the kidney and the kidney looked and felt normal, but it was opened by an incision through its convex border into the pelvis and the finger was inserted into the pelvis. Nothing abnormal was found. The wound in the kidney was closed without drainage and the muscles and skin were closed, leaving room for drainage of the abscess by tube and gauze. Recovery was rapid, and in four weeks the patient was discharged well, except for a slight leak from the ureterovaginal fistula, which soon closed spontaneously.

Remarks. The interesting features about this case were: (1) The enormous size of the calculus, weighing 61 grams (915 grains), measuring 7 cm. (two and three-quarters inches) in length, and 11½ cm. (four and one-half inches) in circumference. It was whitish in color and irregularly spindle-shaped. (2) The occurrence of a large perinephric abscess communicating at some point with the ureter, but apparently having no communication with the kidney. The abscess probably originated from the kidney while occupied by the stone without leaving any macroscopic evidence of the fact, and as it grew in size finally ruptured into the ureter behind the calculus.

Case III.—*Pyelonephritis of the left kidney, with calculi and pyelitis of the right kidney; probably of gonorrheal origin; removal of the left kidney and ureter; later, operation on and drainage of the right kidney.* A man, aged twenty-six years, gave a history of gonorrheal urethritis four years before, and had continued to discharge pus from the urethra ever since. Pain in the region of the left kidney had been almost continuous, with occasional pain in the

right side. He had been treated by internal medication and vesical irrigation, but the pus continued to flow and his health to decline. Chills and fever have been frequent and micturition averaged once an hour day and night. Patient had lost about one-third of his normal weight and was thin and sallow. Pulse, 80 to 94; temperature, 98.4° to 99.4°. Thickening and tenderness were detected in the left loin. No gonoccocci or tubercle bacilli were found in the urine.

The left kidney was exposed by an oblique incision, and was found converted into a multilocular pus sac, the parenchyma having been destroyed, containing some pus and about a teaspoonful of gravel calculi. The ureter was thickened and dilated its entire length, its lumen admitting the index finger. The kidney was removed and the ureter to within two or three inches of the bladder, making a second incision in front from near the crest of the ilium, inward and downward to a point just above the internal abdominal ring. The stump of the ureter was stitched to the skin in the inguinal region. Much improvement followed this operation, but urine continued to flow through the stump of the ureter when, in March, 1906, about eighteen months later, it was decided to open and drain the right kidney. This was done, and a suppurative pyelitis was found. The kidney was opened from convex border to pelvis and then sewed up around a rubber drainage tube, which was left in place one month and a half, when the urine was nearly all passing to the bladder. The fistula left by the tube soon healed, and that from the ureteral stump healed a few months later; the patient gained his normal weight and returned to his work six years from the beginning of his disease and after two years continuous stay in hospital. When seen recently the patient was in fair health, up to his normal weight, attending to his business, but was still passing some pus with his urine, and the ureteral fistula had opened again.

Case IV.—*Tuberculosis of the right kidney and ureter; nephro-ureterectomy; death.* A woman, aged twenty-eight years, the mother of one child, was taken sick in February, 1904, with cold, cough, frequent urination, cessation of menstruation, and pain in the right loin. In April pus was found in the urine, and she went

to bed with fever, 98° to 104°, nausea, occasional vomiting, and rapid loss of flesh. Examination three months after the disease began showed a very sick woman, suffering much pain in the right loin, frequent urination, and pulse, 120; temperature, 97.2° to 102°. A nodular tender mass could be easily felt below the ribs on the right side and extending into the iliac fossa. Tubercle bacilli

FIG. 6.—Tuberculous kidney.

found in the urine. The kidney and the ureter to a little below the brim of the pelvis were removed through the oblique incision. Death three days later during a convulsion. It was impossible to ascertain the quantity of urine passed, as it was passed involuntarily. The kidney was studded throughout with small tuberculous nodules and abscesses. The ureter also was very much thickened and diseased (see Figs. 6 and 7).

Remarks. No doubt both kidneys were diseased, and after the operation the remaining one was unable to keep up the work of elimination to a viable degree. The patient was doomed, and had no chance of cure under any method of treatment.

Case V.—*Perinephric abscess communicating with the kidney, result of catheterization in a patient with fractured spine.* A man, aged thirty-two years, had a laminectomy performed March, 1902,

Fig. 7.—Tuberculous kidney and ureter.

on account of fracture of the eleventh and twelfth dorsal vertebræ. After six months of catheterization the patient had chills, fever, sweats, pain in the right loin, pus in the urine, and a tender mass could be felt in the region of the right kidney.

Operation showed a large perinephric abscess behind the kidney and communicating with its lower portion. The abscess was drained and the patient recovered in six weeks. Seven months later death occurred from acute intestinal obstruction.

THE DIAGNOSIS AND TREATMENT OF KIDNEY STONE.[1]

By ARTHUR DEAN BEVAN, M.D.,
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THE subject of this paper is the diagnosis and treatment of kidney stone. In a brief paper one would not have the time to review fully the history of kidney-stone surgery, as the history alone of this subject would furnish an interesting discussion. We must content ourselves with mentioning merely the landmarks of its development. For many years stones were occasionally removed from suppurating kidneys by lumbar incision. Not until 1880 was a stone removed by incision through the tissue of a fairly normal kidney; this was done by Henry Morris, of England. From 1880 until 1897 or 1898 a number of operators followed Morris' lead, and in 1898 Morris could report 34 nephrolithotomies, with fortunately but one death. The men who contributed most to this development were, besides Morris, Tuffier, Rovsing and Israel abroad, and in America, Charles T. Parkes and Christian Fenger. The work done from 1880 to 1898 was brilliant in a way, but was unsatisfactory because of the uncertainties of diagnosis. During this period a large proportion of the operations were exploratory, and many of the operations undertaken for stone proved to be for tuberculosis, neoplasm, and other pathological conditions. In the last ten years—that is, the period from 1898 to 1908—there has been a great development in the surgery of the kidney, thanks to the introduction of the *x*-rays, and means of collecting the urines sepa-

[1] I desire to acknowledge my great indebtedness in this work to my associate, Dr. Joseph F. Smith, who has, since 1898, had charge of the *x*-ray work in these kidney cases.

rately, and other refined means of diagnosis—cryoscopy, etc. Of these, the *x*-rays have been by far the most important.

These newer means of diagnosis have resulted in an enormous increase in the number of cases discovered and operated upon, and, with better technique, have resulted in increasing the percentage of recoveries and the number of complete and permanent cures.

A word in regard to pathology and natural history of kidney stone. Of all the possible factors which have been discussed, heredity, water, food, rachitis, gout, rheumatism, diseases and injuries of spine, etc., the most important is probably that of infection.

The stone-bearing catarrh of Meckel, which has comparatively recently been again emphasized by Ebstein, is probably the essential cause in stone formation. This becomes more certain when we discuss the subject of calculus formation in general, *i. e.*, gallstones, salivary calculi, etc. I take it as proved that infection of a catarrhal, and not a suppurative, type is the essential cause of gallstone formation, the germ forms being probably typhoid and colon, as a rule. And I believe that the same is true of urinary calculi in general. As a strong argument in favor of this position, I would cite the fact that, in more than half of the cases of fracture of the spine with resulting hemiplegia, stone either in the kidney or bladder is found, if the patient survives the injury for a year or more. We know how frequently, how, in fact, almost invariably, the urinary tract becomes infected in these cases. And this infection is, I believe, the cause of stone formation. The common germ forms are probably here, as in gallstone, colon and typhoid, and probably staphylococcus, gonococcus, etc.

In order to produce the so-called primary stones, that is, stones without evident pus formation, the character of the inflammation must be catarrhal and not suppurative.

In about one-half of the cases there is but a single stone; the number may run into the hundreds. In probably 20 per cent. or more of the cases both kidneys are involved.

The size of the stone varies from the size of a grain of wheat, or

less, to two or three pounds in weight, as reported by Lee, Potel, and others cited by Garré.

When there is but a single stone, it is usually oval or spherical, or may be branched to fill the pelvis and calices; sometimes a stone in the pelvis will have a horn-like projection passing into the upper end of the ureter. As a rule, the stones found in the ureter are formed in the kidney; they may, however, grow in the ureter and form long, cucumber-shaped stones filling a dilated ureter for several inches, their shape being controlled by the shape of the ureter.

I shall not go into the details of the chemical formation of stone, simply reminding you of the fact that the many substances found normally in the urine may enter more or less into their composition. Uric acid and urates, oxalates, phosphates, carbonate of calcium, and the rarer forms, xanthin, cystin, indigo, etc.

Stones may remain in the kidney for years without causing symptoms. They may, when small, be passed through the ureter, bladder, and urethra with complete recovery of the patient.

They may ulcerate into the duodenum or colon or through the kidney, leading to perinephritic abscess, or into the peritoneum, leading to peritonitis. They may lead to the destruction of the kidney so that it becomes changed into a pus sac, or to complete atrophy of kidney tissue with the stone left in a mass of fat, which surrounds it. They may favor the location of tuberculosis in a kidney, and possibly, as do gallstones, by chronic irritation lead to development of carcinoma. A stone in one kidney may lead to cystitis, ascending inflammation of the other kidney, and fatal termination. A careful examination of cases in which but one kidney is involved leads to the conclusion that when the stone has existed for some time the other kidney shows some evidence of chronic change.

When, on account of stone, a kidney becomes practically destroyed, the other kidney undergoes a compensatory hypertrophy sufficient to carry on the kidney function of the body.

Some of the results of stone are: Chronic sepsis, amyloid changes in internal organs, marked secondary anemia from hemorrhage,

and even fatal hemorrhage, calculous anuria, due either to stone in the ureter of a single kidney or to stones in both kidneys or to stone in one kidney blocking up ureter and reflex anuria on the other side.

The ordinary picture of kidney stone is that of kidney colic of greater or less frequency, with pain in the kidney region and radiating from this region; blood usually microscopic, sometimes, however, in large amount in the urine, and pus, with not infrequent bladder symptoms due to a resulting or accompanying cystitis.

The differential diagnosis must be made between stone and tuberculosis and neoplasms of the kidney, kidney infections and displacements, and such rarer conditions, as essential kidney hemorrhage and polycystic degeneration of the kidney, and various lesions of other organs, as gallstone disease, appendicitis, ileus. Sometimes it is by no means easy to make the differential diagnosis without an exhaustive study. I have seen kidney-stone colic produce the typical picture of ileus. I have seen appendicitis produce the typical picture of kidney colic, accompanied even by a considerable amount of blood in the urine. I have four times removed the appendix in the interval on the strength of the diagnosis made by well-qualified men, who had taken care of the patients during the attacks, and found not appendicitis, but kidney stone.

DIAGNOSIS.

1. *History.* A careful history of the onset, character, and duration of attacks may often be of great value in making a probable diagnosis.

2. *Pain* in some degree occurs in practically all calculous cases. Pain is, however, a frequent accompaniment of non-calculous diseases of the kidney, and for this reason is not of great diagnostic value. That nephrolithiasis may occur without pain is shown by the report by Clark (quoted by Brewer) of 24 autopsies on calculous cases, 13 of whom had had no pain.

The size of the stone has no definite relation to the character or amount of pain. Large calculi occupying the pelvis of the kidney may give little or no pain. On the other hand, small rough stones

that make their way into the ureter may cause the most agonizing pain.

Palpation of the kidney may be of value in calculous cases, although generally the findings are negative. Rarely, on palpation, crepitus produced by fragments of stone rubbing together may be felt. The kidney is often enlarged and tender. Israel has described a reflex irritability with rigidity of the ureter in calculous cases, causing the ureter to feel like a firm cord when palpated through the rectum or vagina.

3. *Hematuria.* The amount of blood in the urine may vary from a few corpuscles, found by microscopic examination of the centrifuged specimen obtained during or after an attack, to large and even fatal hemorrhages.

Cunningham[1] found hematuria twenty-two times in 48 cases. Brewer found blood present in 45 per cent. of calculous cases, and also in 41 per cent. of non-calculous renal diseases. Hematuria, especially occurring in microscopic amounts during or after an attack of renal colic, is a finding of considerable importance in establishing a diagnosis.

4. *Other urine findings*, such as renal sand, crystals, small calculi, fragments of calculi, renal or ureteral epithelium, leukocytes often seen in clumps, macroscopic pus, are findings of importance. Cunningham (quoted by Brewer) found pus thirty-nine times in 48 cases reported.

5. *Vesical tenesmus* or rectal tenesmus is frequently felt when a stone is moving in the lower portion of the ureter; cystitis frequently accompanies the pyelitis and ureteritis set up by a stone in the pelvis of the kidney or in the ureter and gives rise to frequency of micturition. Occasionally a stone in the lower portion of the ureter can be palpated per rectum, or per vaginam in the female.

6. *Leukocytosis* is often present in the infected cases, and depends upon the degree of infection and amount of septic material absorbed. Chills and irregular temperature may also characterize the severely septic cases.

7. *Cystoscopy* and ureteral catheterization.

[1] American Journal Medical Sciences, May, 1908.

Cystoscopy may be of great value in calculous cases. A stone impacted in the ureteral orifice may be seen protruding or causing prolapse, widening or edema of the ureteral orifice, and a ureteral bougie passed into the ureter may give definite evidence of obstruction.

The wax-tipped bougies used by Kelly when passed into the ureter may show scratches produced by contact with a stone.

This method is applicable only in the female and by the direct cystoscopy as practised by Kelly. Wax-tipped catheters do not give

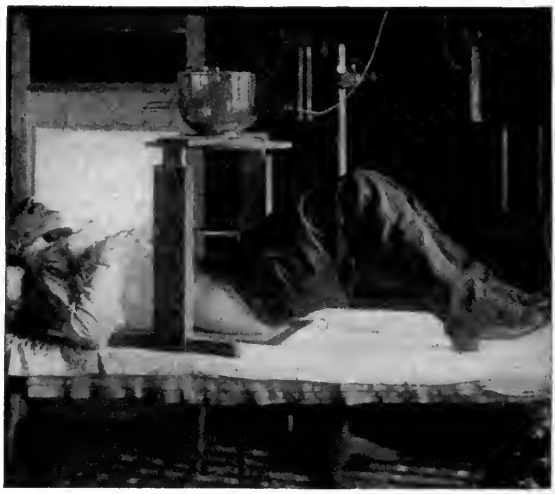

FIG. 1.—Apparatus arranged for taking a general view of both kidneys, both ureters, and the bladder.

reliable information when used with the European cystoscopes, because of the scratches produced by the instrument through which the bougie is passed.

Examination of the ureteral orifice will often show from which side the blood or pus is coming, and catheterization of the ureters enables one to obtain the separated urines and examine them for blood, pus, bacteria, epithelium, etc., as well as to determine the functional capacity of the two kidneys.

8. *Functional tests.*

Leik[1] reports ten cases of renal calculus in which the functional capacity of the two kidneys was determined. He found the functional capacity of the affected kidney lessened in all cases, even the mild aseptic cases showing marked diminution of the functional power. Of the various methods that have been employed in determining the functional capacity of the kidney, the following are the most reliable and easy of application:

FIG. 2.—Apparatus arranged for taking a circumscribed area by means of the compression diaphragm.

(*a*) The indigocarmine test, made by injecting 5 to 10 c.c. of sterile indigocarmine solution into the gluteal muscles, introducing the cystoscope twenty minutes after the injection, and observing the rhythmical puffs of deep blue colored urine as it escapes from the ureter. In this manner the ureteral orifices can be located in cases in which they are difficult to locate by simple cystoscopy, and the fact established as to whether or not both kidneys are excreting. By some observers the time required for the blue color to appear

[1] Archiv f. klin. Chirurg., Band lxxxv, Heft 2.

in the urine and the intensity of the color are regarded as being of value in determining the functional capacity of the kidneys. Since it has been shown, however, that normal kidneys vary in their power to excrete this coloring matter, it is doubtful whether or not this test is of much real value in determining functional capacity.

FIG. 3.—Typical skiagraph taken with compression diaphragm, showing several large and small calculi in the pelvis and parenchyma of the kidney.

(*b*) The phloridzin test, described by Casper and Richter, depends upon the fact that when phloridzin is injected subcutaneously, glycosuria appears in fifteen to thirty minutes in a healthy condition of the kidneys and continues from one to three hours.

The test is made by injecting subcutaneously 1 c.c. of a sterile 1 per cent. solution of phloridzin and testing the urine for sugar at intervals of five minutes by Fehling's or Haines' solution. Kapsammer maintains that this test gives reliable information as to the excreting power of the renal parenchyma, and that when sugar appears in the bladder urine in fifteen or twenty minutes after the injection, the functional power may be considered normal, whether one kidney or both are active. In cases in which the reaction is delayed thirty minutes or more, the functional capacity may be regarded as decreased.

By collecting the separate urines and testing each at five-minute intervals after the injection, the functional capacity of each kidney may be determined. In normal conditions of both kidneys sugar appears simultaneously in the urine from both kidneys and is excreted in equal amounts. If one kidney is diseased and the other sound, the phloridzin glycosuria is delayed in time and lessened in amount on the affected side, and appears in the usual time and amount on the sound side.

(*c*) Cryoscopy, described by Koranyi and recommended and much employed by Kümmel and others, consists in the determination of the molecular concentration of the blood serum and urine by measuring the freezing points of the blood and urine. It depends upon the fact that in health the blood maintains a definite degree of molecular concentration, and has a practically constant freezing point, 0.55° to 0.57°. The excreting power of the kidneys is the most important factor in maintaining the constant molecular concentration of the blood. In conditions in which the renal parenchyma is damaged and the power of excretion lessened, the molecular concentration of the blood increases, on account of the accumulation of salts in the blood, and the freezing point is lowered to 0.6°, or lower. Cryoscopy of the blood, therefore, seems to give us definite and valuable information as to the total renal functional power. It does not give us any information as to the relative capacity of the two kidneys. Cryoscopy of the urine seems to be of little practical value, not more than a determination of the specific gravity, according to Kapsammer.

9. *Röntgen examination.*

The introduction of the Röntgen rays as a means of diagnosis marks the most important advance made in the surgery of renal and ureteral calculi in modern times. The present improved technique has rendered this means of diagnosis sufficiently accurate to entitle it to rank with other commonly employed means of diagnosis of generally recognized value, such as the examination of sputum and urine for tubercle bacilli, feces for blood and parasites, etc.

The accuracy of the method depends upon the skill and experience of the operator making the examination and the interpretation of the plate, the efficiency of the apparatus at hand, and the technique employed. The following reports show the percentage of correct diagnoses as reported by the several observers in their own work:

		Cases.	Correct Per cent.
Kümmel and Rumpel	1903	18	100
Smith and Bevan[1]	1904	27	96
Leonard	1907	356	97
Brewer	1908	57	78

The apparatus employed generally consists of an induction coil capable of giving a secondary spark from six to twenty inches in air. The spark length is less important, however, than the amount of current measured in milliamperes passing in the secondary of the coil, since the number of milliamperes passing represents the amount of energy available to be transformed by the tube into Röntgen rays. The tube is, however, the most important part of the equipment. It should be capable of adjustment to the particular case in hand, and also be capable of carrying, for a sufficiently long period of time, the necessary amount of secondary current to produce sufficient Röntgen rays to secure proper penetration of the tissues.

The shadows produced by calculi of various compositions vary widely in density. Urate and uric acid stones produce almost no shadow, even when placed directly upon the photographic plate

[1] Since that time an increasing number of cases have maintained the same percentages.

and exposed to Röntgen rays. Fortunately, pure urate or uric acid calculi are of rare occurrence, enough oxalates, phosphates, and carbonates generally being present to give shadows on the plates.

The phosphatic calculi are second in point of density and the oxalates third, being the most dense, and, therefore, giving the most definite shadows of any of the ordinary forms of urinary concretions.

FIG. 4.—Large mass of stones removed from pelvis and calices of kidney.

The preliminary preparation of the patient for the Röntgen examination is important, especially the thorough emptying of the gastro-intestinal tract. This is best accomplished by giving a brisk saline cathartic the night before and a colonic flushing in the morning. The patient should eat no solid food for twelve to eighteen hours before the examination; the peristaltic motions of the bowels as well as the bowel contents interfere considerably with the clear-

ness of detail in the plates. This fact has been shown by taking plates of cadavers and comparing them with plates obtained from the living subject.

Since the clinical symptoms give but little information as to the exact location of calculi in the genito-urinary tract, it is desirable to first secure, if possible, a plate showing the region of both kidneys, both ureters, and part of the bladder, as shown in Fig. 1. For this purpose the patient lies on his back, with head and knees elevated, so as to straighten the spine and bring it in contact with the plate. The tube is enclosed in a heavy lead glass tube shield, and supported upon a stand twenty-six to thirty inches high, with telescoping sides, permitting a greater elevation, if necessary. The top of the stand carries a circular piece of heavy sheet-lead, with an opening in the centre for diaphragms of various sizes. This heavy lead disk cuts off the stray rays from the walls of the tube and the diaphragm opening limits the rays that are to be used to a cone of approximately parallel rays. A satisfactory plate should have the following characteristics:

1. It should show the lateral processes of the vertebræ to the tip.
2. It should show the structure of the last two ribs.
3. It should show the border of the psoas muscle.

The importance of this general view of the entire genito-urinary tract is very great, in view of the fact that the clinical symptoms are often most misleading as to the location of the calculus. Several cases have been reported in which the symptoms pointed to a calculus on one side, but the Röntgen rays showed the location to be on the opposite side. The writer has had this experience in two cases. In both cases there were severe symptoms referable to the right side, while the Röntgen rays showed the presence of a calculus in the lower portion of the ureter on the left side.

After a satisfactory view has been obtained, if there are any evidences of stone in any particular location, other plates of that portion should be made, using the compression diaphragm apparatus as shown in Fig. 2. This method, first introduced by Albers-Schönberg, has the advantage of giving clearer and more definite pictures of a limited area, owing to the fact that the diaphragm

renders the rays more nearly parallel, the lead cylinder and shield cut off many stray rays, and the compression can be made so as to considerably diminish the amount of tissue to be penetrated by the rays. Fig. 3 shows a typical compression diaphragm view of a kidney containing several calculi.

FIG. 5.—Typical skiagraph showing several stones in the pelvis of the right kidney.

Some of the enthusiastic workers in the field of Röntgen diagnosis believe it is possible to demonstrate by this method the presence or absence of a calculus in all cases.

The difficulties presented in certain classes of cases would hardly

seem to warrant the statement that negative findings with the Röntgen method can be entirely relied upon to exclude the presence of stone, especially in the following group of cases:

1. Those in which the calculi are entirely or almost entirely made up of uric acid or urates. It has been demonstrated that even fairly large concretions of uric acid and urates do not make a visible

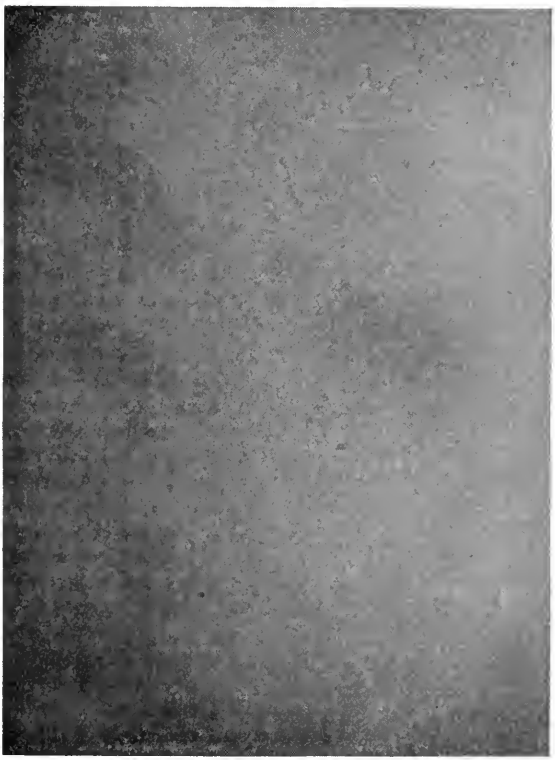

FIG. 6.—Typical skiagraph of a single stone in the pelvis of the right kidney.

shadow, even when exposures are made through very thin masses of tissue.

2. Cases with thick, fat abdominal walls, with much fat in the omentum and mesentery. Fat, flabby individuals are far more difficult to skiagraph satisfactorily than muscular individuals of the

same thickness, perhaps owing to the greater diffusion of the rays by fatty than by muscular tissues. This difficulty seems very hard to overcome, and a negative diagnosis in many of these cases cannot be made with certainty.

3. Very large calculi or collections of several calculi in the kidney often give a very indefinite outline, owing to the irregularity of the mass and the variations in its density. Very large, as well as very small, calculi are, therefore, especially liable to be overlooked.

The cases of ureteral calculus also present some peculiar difficulties that make the diagnosis more difficult than the diagnosis of calculi in the pelvis or parenchyma of the kidney.

In the course of the lower portion of the ureter, shadows are frequently seen that have, in several instances, been mistaken for ureteral calculi, and operations have been performed under the mistaken diagnosis so made, with the result that nothing was found in the ureter, but some other condition was present which sufficed to explain the occurrence of the shadows in the Röntgen plates. Among the extra-ureteral conditions, giving rise to misleading shadows in the plates, may be mentioned:

1. Phleboliths or calcified areas in the walls of the veins in the pelvis.

2. Foreign bodies in the bowel, vagina, or bladder.

3. Calcified appendices epiploicæ.

4. Calcified tuberculous lymph nodes or tuberculous nodules in the epididymis or seminal vesicles that have become partly calcified.

5. Calcified or osseous areas in the pelvic ligaments. In examining 100 plates of adult pelves taken for various conditions, it was found that in 25 per cent. of the plates small, round shadows, varying in size from a BB shot to a pea, occur in the vicinity of the spine of the ischium, frequently bilateral and often multiple. They do not occur in the plates of the pelves of children. The peculiar location of these bodies and their frequent occurrence in both male and female pelvis render their explanation as ossified areas in the pelvic ligaments most probable.

These bodies have, doubtless, in many instances, been diagnosticated as calculi in the vesical portion of the ureter.

Because of the occurrence of these misleading shadows along the course of the lower ureter, the introduction of a lead bougie, or ureteral catheter carrying a metallic stylet, before taking a skiagraph has been proposed by several writers, in the hope that by this means extra-ureteral shadows can be distinguished from shadows produced by intra-ureteral bodies. By turning the patient slightly and taking two or more views at different angles, the possibility of extra-ureteral bodies lying in the same anteroposterior plane can be eliminated. This procedure has much to commend it, and should be tried in all cases of suspected ureteral calculus in which the Röntgen plates show shadows along the course of the ureter.

DIFFERENTIAL DIAGNOSIS.

Since the clinical picture of renal calculus often closely resembles that seen in other abdominal and pelvic conditions, a careful study of the urine is of the utmost importance in all cases of suspected stone. The final decision in making a positive diagnosis of calculus must, in the vast majority of cases, depend upon the findings of the Röntgen method. Among the commoner conditions liable to be mistaken for renal calculus are:

1. Acute or chronic appendicitis. In many of the acute appendicitis cases blood is found in microscopic quantities in the urine. Reliance must be placed upon the skiagraph in many of these cases in making a differential diagnosis.

2. Tuberculosis and tumors of the kidney, ureter, and bladder. The finding of tubercle bacilli, in the tuberculous cases, or fragments of tumor tissue may give positive evidence. In searching for tubercle bacilli in urine, a large quantity must be carefully centrifuged and stained by carbol fuchsin, using acid alcohol as a destaining agent to avoid confusion with smegma bacilli. Frequently animal inoculations will have to be made before a positive diagnosis can be made.

3. Intermittent hydronephrosis in cases of movable kidney, with kinking of the ureter, may resemble renal calculus. Change

of posture, allowing the kidney to slip back into place, relieving the kinking of the ureter, the hydronephrosis, and the swelling, may cause disappearance of the symptoms.

4. Acute nephritis, essential renal hematuria, with blocking of the ureter by clot, may give typical attacks of renal colic. Study of

FIG. 7.—Skiagraph of pelvis showing sing'e small round calcified nodule in the pelvic ligaments in the right side.

the urine and the Röntgen rays must be relied upon in doubtful cases.

5. Biliary and pancreatic calculi, intestinal obstruction, may be confused with renal conditions, especially on the right side. Careful history, study of the feces, and careful Röntgen examination will generally serve to make possible a differential diagnosis. Gall-stones seldom give visible shadows with Röntgen rays.

6. Psoas abscess may be mistaken for renal conditions, especially perinephritic abscess as a sequence of septic calculous disease. Here the finding of a spinal lesion, either by examination or by Röntgen rays, and the absence of shadows of stone in the kidney, will generally make the diagnosis.

When a definite diagnosis of stone is made and the size and position of the calculus are known, I am in favor of surgical removal, except in cases where there is a strong contra-indication on account of age or organic disease, or where the stone is so small that it may be passed by the ureter, bladder, and urethra.

I have had the opportunity of watching a number of cases handled expectantly, and have seen so many serious consequences, such as attacks of anuria, infection, and colic, occur, and injury to the kidney tissue result, that I am satisfied that the dangers of operation are not as great as the dangers carried by the continuance of the condition; and the operation has the great additional advantage of curing the patient, which the expectant treatment seldom does.

To be sure, I have seen a number of cases recover without operation. I recall one in particular, a big, strong fellow, who had a stone a little larger than a coffee bean. We obtained, after a number of exposures, several very good plates, confirming the diagnosis. When I first took charge of the patient I recommended temporarily expectant treatment. The colics recurred, however, and the stone did not pass, so I advised surgical removal. He could not bring himself to an operation, and for several years suffered from very severe and frequent colics and had several attacks of serious temporary anuria. He suffered more in any one of a dozen attacks than he would from an operation, and certainly ran more risk from his anuria attacks than he would have from surgical interference, but he finally passed his stone and rejoiced that he had escaped an operation. It is upon such weak evidence as this that many of the pleas of non-interference are based. Against this man, who was practically invalided for several years and suffered very greatly, I could place a dozen men who were operated on during this same period, who had less pain from the operation than from an attack of colic, and left the hospital within two weeks perfectly cured.

There are, to be sure, some conditions which demand immediate action, as calculous anuria, infection, etc., where there can be no question about the propriety of surgical intervention. I would plead for the adoption of surgical removal of kidney stone not only in these, but in all cases in which the diagnosis is made—and the earlier the better, with some few exceptions, namely, the cases of extreme age and other organic disease, making operation extremely dangerous, and the cases with very small stones, which should be given a reasonable time with the hope that they may be passed.

One very strong argument in favor of removing kidney stones, where they are not producing urgent symptoms, is that of preventing the occurrence of urgent symptoms by removing the stone, which, if left, might cause them; and, again, it is perfectly clear that in almost all cases the kidney containing a stone suffers continually from its presence, a more or less chronic change takes place, with impairment of the secreting value of the organ, often leading to total destruction of the kidney tissue. After a definite diagnosis of kidney stone is made with the *x*-rays, other conditions warranting, it should be removed.

Where the *x*-rays show that there is a single small stone, as there is in the majority of cases, and the clinical evidence does not suggest destructive processes in the kidney, I do not employ the cystoscope or ureteral catheter, or make a cryoscopic examination, but proceed at once to the operation. Where the *x*-rays show a large stone or mass of stones, and the clinical history and the pus and blood in the urine suggest the possibility of the necessity of a nephrectomy, an exhaustive study of kidney sufficiency must be made, and the absence or presence and condition of the other kidney determined. This can best be done by collecting the urines separately by ureteral catheters and by a cryoscopic examination of the blood.

I am not one of those who believe in the entire harmlessness of ureteral catheterization. I regard it as a possible cause of danger, and as a means of diagnosis, which should be employed only where definitely required, and not as a routine procedure. It is, however, frequently indispensable. Where definite information can be

obtained by catheterizing the diseased kidney alone, the healthy kidney should not be catheterized; where, however, this cannot be obtained, the catheterization of both may be necessary. The cyroscopic examination of the urine I regard as of little value. I believe, however, that under certain conditions the cryoscopic examination of the blood is of distinct value, as already stated. In a case where there is considerable blood in the urine, a normal blood freezing point, *i. e.*, 0.55° to 0.57°, means kidney sufficiency, and almost certainly the involvement of but one kidney in the diseased process.

Given, therefore, a stone case where the *x*-rays have located the disease and where the ureteral catheter has demonstrated the presence of another kidney, and with a normal freezing point of the blood, a nephrectomy can safely be made if the conditions of the affected kidney, as determined by the operation, warrant. In operating on kidney-stone cases the great frequency of stone occurring in both kidneys, probably in 20 per cent. of cases, should constantly be borne in mind. If stone is demonstrated by *x*-rays in both kidneys, it probably would be safer to operate on both sides at the same sitting.

THE TECHNIQUE OF OPERATION.

The removal of a single stone of moderate size from the pelvis of a kidney not greatly injured by the long-continued presence of the stone and by infection is, as a rule, a comparatively simple operation.

For several years I have been doing these cases under nitrous oxide anesthesia.

The patient is put on the sound side with a good-sized pad under the flank, so as to increase the space between the last rib and the crest of ilium on the side to be operated on. A special assistant is detailed to hold the limb of the operated side at right angles to the body. I prefer the pad and an assistant to any of the special tables and supports which have been introduced for kidney work.

If the anesthesia is a very prolonged one, and sufficient relaxation cannot be obtained from gas, the sequence of gas and ether are

employed. The oblique kidney cut, extending from the last rib where it is crossed by the erector spinæ obliquely downward and outward a finger's breadth above the crest of the ilium, is employed. The length of the incision will depend upon the size of the patient and the difficulties of the case. The incision should be of sufficient length to permit the introduction of the entire hand. This incision divides skin, superficial fascia, latissimus dorsi muscle, lumbar fascia, and external oblique, and, where it is extended well forward above the crest, the internal oblique and transversalis muscles. The fat capsule is exposed and carefully separated from the kidney so that the kidney may be lifted well up into the wound and freely palpated.

If the single stone is found in the pelvis, the kidney is so held as to expose the posterior surface of the pelvis, and this is freed from fat and areolar tissue with blunt dissecting forceps. The pelvis is behind the renal vessels, so that these cannot be injured if the posterior wall of the pelvis is opened, except in the event of some unusual distribution of the vessels; it is in order to avoid this, that the posterior wall of the pelvis should be cleared of fat and areolar tissue, so that one can see that no vessel is injured in incising the pelvis. An incision is now made through the wall down to the stone and the stone extracted. The incision should then be closed with a single layer of fine catgut sutures introduced like Lembert sutures, the kidney dropped back into position, and a cigarette drain carried to the point of closure. The external wound is closed with moderate sized catgut through the deep muscles. Through and through silkworm gut and horsehair through the skin. The cigarette drain is removed in three or four days; in more than one-half of the cases there will be no leakage of urine. The stitches are removed on the eighth day, as a rule, and the patient allowed to leave the hospital in from ten to fourteen days.

This operation through the pelvis is known as pyelotomy, and it is the operation of choice in moderate sized, single stones in the pelvis in non-suppurative cases.

For a long time it was taught that urinary fistulæ were much more apt to result in cases in which the stone was removed through

an incision in the pelvis than where it was removed through an incision in the kidney substance. My work of the last five years has distinctly disproved this view, and my results have been confirmed by a number of other operators.

Today I think we can confidently select pyelotomy in preference to nephrotomy, as being the safer, less bloody, and more satisfactory procedure.

Where, on the other hand, we have a large branched stone, coral-shaped stones, multiple stones, and stones accompanied by distinct and gross evidence of infection, then nephrotomy should be preferred to pyelotomy.

In nephrolithotomy the kidney should be well freed and brought out of the wound; a well-instructed assistant should compress the renal vessels with his fingers, so as to control hemorrhage. Especially constructed clamps may be employed for this purpose. I have always preferred an assistant.

An incision like the postmortem cut is made about a centimeter posterior to the convex border of the kidney and directed toward the pelvis. This may be from two to five inches or more in length. If the assistant making pressure on the renal vessels does his part thoroughly, little blood will be lost.

The stone or stones are now removed with great care not to break them or leave any stone or stone fragment behind. The incision in the kidney is then, when there is no gross evidence of pus, completely closed by catgut sutures deeply placed and carefully tied so as not to cut through the tissue, which is quite friable. These sutures control the hemorrhage surprisingly well, and it is seldom necessary to ligate a vessel separately. The kidney is now dropped back into its normal position, a cigarette drain introduced, and the wound closed as before.

Where there is gross evidence of pus in the kidney, it is important to determine before operation the presence and condition of the other kidney and the kidney sufficiency of the individual, so that, if at operation the conditions found argue in favor of nephrectomy, this may be undertaken with a full knowledge of the existing facts.

In case a stone is removed from a kidney with gross evidence of

pus and impaired kidney tissue, if the impairment is not great, the kidney can be drained after the removal of the stones, in the hope that a cure may result with the saving of a kidney of more or less value. On the other hand, where the kidney shows great changes, and it is evident that the kidney is of little value to the individual, and if left may be a menace, and if kidney sufficiency exists as shown by examination before operation, then a nephrectomy should de done.

In the last few years I have been removing more of these old stone kidneys at the primary operation, avoiding often a later difficult and dangerous secondary nephrectomy. It has been especially in this matter that my own work has, in the last few years, shown improvement. In the surgery of kidney stone it is not sufficient merely to remove the stone. We must cure our patient, and, where possible, it is far better to do this with a single operation. I have found nephrectomy secondary to nephrolithotomy and nephrotomy for drainage often most difficult and hazardous; the kidney remnant being often bound down in dense connective tissue, making removal, except by morcellement and within the capsule, impossible; and even then I have injured the colon and duodenum and had serious and fatal hemorrhage in these cases.

When the stone is in the ureter the operation is, on the whole, more difficult than when in the kidney. If in the upper end of the ureter, the operation is much the same as a pyelotomy. If well down, the oblique kidney incision must be extended along the crest to well toward the internal ring, keeping outside the peritoneum.

All the ureter, except the last few inches, can be reached by the incision, the stone may be removed, and the ureter sutured and field drained as in pyelotomy. When the stone is projecting toward the bladder, it may be removed through a transvesical route. Where a stone cannot be reached either from above or through the bladder, it may be reached through the vagina or by a parasacral route, much the same as a Kraske incision.

Dr. McArthur and myself were the first in this country to use successfully the *x*-rays in the diagnosis for stone, and we were fortunate to precede the continental surgeons by some months; we

were preceded, however, by several English operators. Since the introduction of the *x*-rays I have located and removed by operation stones in about fifty cases.

I shall not give a detailed report of the entire series. I shall simply take a number to illustrate the most important points. As

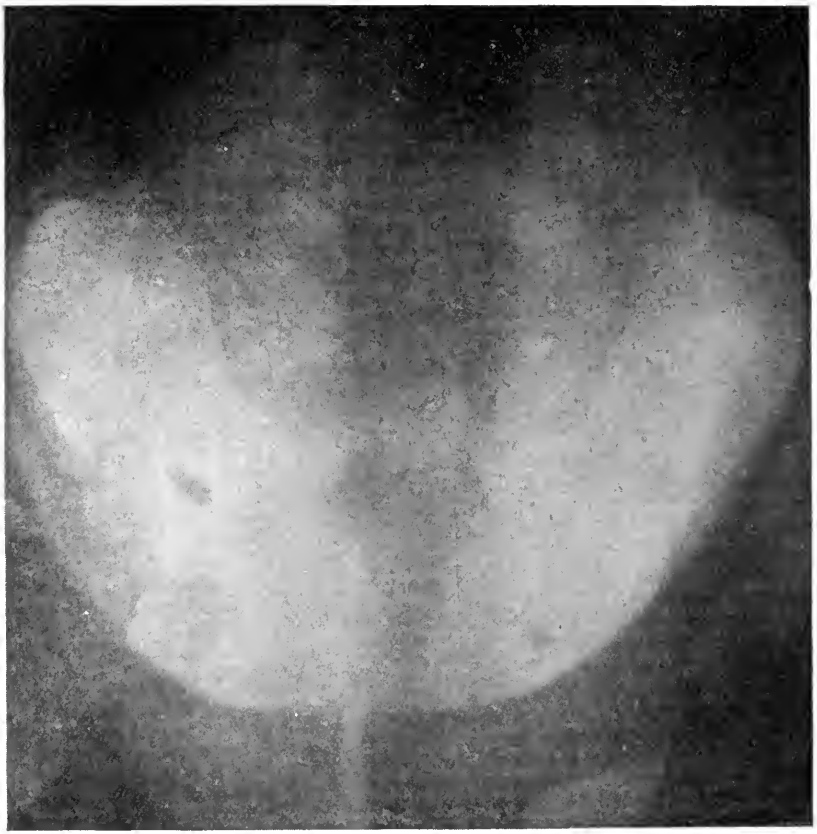

FIG. 8.—Skiagraph showing calculus in lower end of left ureter and small round calcified area in pelvic ligaments on the right side.

an example of the simple type of a single stone in a non-suppurating kidney, which fortunately represents more than one-half the series:

A. A physician, a classmate of mine, had a number of attacks of renal colic; these became more frequent and threatened to invalid

him. He came to my service, and my associate, Dr. J. F. Smith, secured several very good *x*-rays showing a stone about the size of the end of my thumb in the right pelvis. There was but a microscopic amount of pus and blood. No attempt was made to catheterize the ureters. A pyelotomy was made; a few drops of urine escaped along the drainage for a few days; stitches removed, and the patient left the hospital on the tenth day.

As illustrating some of the complicated cases I shall cite, first:

B. Cure persistent fistulæ.

Before the days of the *x*-rays Dr. Nicholas Senn drained a kidney with the probable diagnosis of tuberculosis. The fistula persisted. After the *x*-rays were introduced I obtained several good skiagraphs, showing a stone the size of an almond. I removed the stone from a kidney, the seat of a mild suppurative process. The fistula persisted for years; at first about twenty ounces of urine escaped each day. This gradually decreased until recently I found that it amounted to about one and one-half ounces of fluid, and that it contained less than about one-tenth the solids of the bladder urine. The fistula was a source of discomfort and a menace, as at times the tube would come out during sleep and the fistula close, so that the tube could not be reintroduced, then retention of pus, with marked constitutional disturbances, would occur, chills, fever, etc., and within a few days a discharge of pus from the fistula. On that account I recommended a secondary nephrectomy. This was done recently with great difficulty and the remnant of a kidney (Fig. 9) removed.

C. Stone and tuberculosis.

A girl, aged eighteen years, sent to me with diagnosis of several appendix attacks. I removed the appendix; later she had a severe attack, which was found to be due to kidney stone. This was removed. Later, attack on same side; examination of specimen obtained by ureteral catheter showed tubercle bacilli. Nephrectomy, a tuberculous kidney. Patient remained well for several years; was then brought to the hospital with complete anuria, which had existed for several days. Nephrotomy under gas with drainage, followed by a large amount of urine from wound. An *x*-ray

showed a small stone in lower end of ureter. This passed on the tenth day into bladder; the kidney tube removed. Kidney wound closed rapidly; urinated within two weeks, and passed stone, per urethram; has been entirely well since this attack, now several years ago.

D. Bilateral stone, with complications:

A medical student; stone diagnosticated and removed on one side. Later, pain on other side; stones shown by *x*-rays and removed. This left urinary fistula for some months. This was curretted, and healed later. Side upon which first operation was done gave

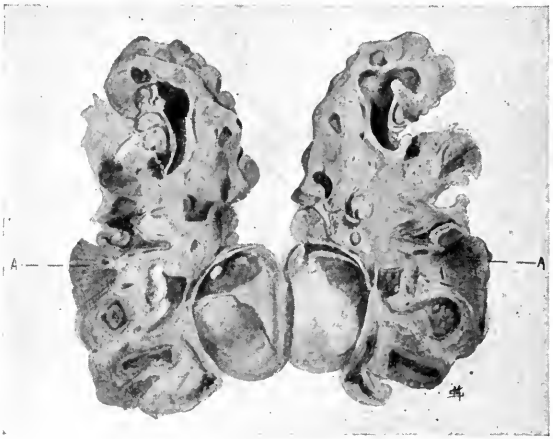

FIG. 9.—Chronic suppurative pyelitis with destruction of the kidney and replacement by adipose and scar tissue. Intermittent obstruction of ureter. *A*, remnant of kidney tissue.

symptoms. *X*-rays showed four stones. When patient was brought to the hospital he was in such bad condition I was afraid to use ether or chloroform. It was at a time when we had not learned of the possibilities of nitrous oxide. So, under cocaine anesthesia I removed these four stones. Since that time patient has been entirely well. He is now an active successful practitioner.

E. Bilateral stones of enormous size.

A young man brought to my service with distinct history of kidney stone on the right side. *X*-rays showed a shadow as large

as a kidney and several small shadows. Operation showed the large shadow was an enormous stone in the pelvis, and the other shadows stones in calices (Fig. 9). In removing these stones I tore away part of the pelvic mucosa. The patient recovered after prolonged drainage. Years later, the patient returned with the same symptoms on the other side. Here a large kidney tumor could be felt, and, on palpation, crepitus due to large stones rubbing together could be distinctly felt.

I operated under gas, and removed an enormous collection of stones (Fig. 10). The kidney was so riddled that I was tempted to do a nephrectomy, but refrained, because I did not know the

FIG. 10.—Kidney stone removed by nephrolithotomy, with attempt made to save the kidney. Natural size.

condition of the other kidney. He died of hemorrhage and shock. Postmortem showed that the first kidney operated on had been reduced to a small hydronephrotic sac without any kidney substance.

F. Where *x*-rays failed to show stone distinctly and *x*-ray burn occurred.

A man, aged sixty years, had symptoms of kidney stone on the left side. This was in the early days of the *x*-rays, when our technique was crude. An *x*-ray failed to find stone. I operated and removed a small, flat stone, about as large in diameter as a silver

dime, from the pelvis. The man had had three *x*-ray exposures at intervals of two or three days, none longer than ten minutes. Ten days after operation patient had what I supposed, in my ignorance, to be erysipelas develop on the abdomen, an area a foot in diameter, with centre at the umbilicus. This proved to be an *x*-ray burn which was slow in healing. It took four months to heal completely. This was the only burn we have had in our series of now several hundred exposures for kidney lesions. Another interesting fact in connection with this case is that after operation,

FIG. 11.—Kidney stone removed by nephrolithotomy, with attempt to save the kidney. Natural size.

on careful examination of the *x*-ray plate, we could clearly see the stone covered by the twelfth rib.

G. Stone with anuria.

A young man, aged twenty years, was brought to the hospital with complete anuria for a week. Examination showed enormous hydronephrotic sac on the left side; this was opened and drained; no relief. The next day the left kidney was drained. This was found to be enlarged by compensatory hypertrophy to about twice the size of a normal kidney (Fig. 11). A large amount of urine

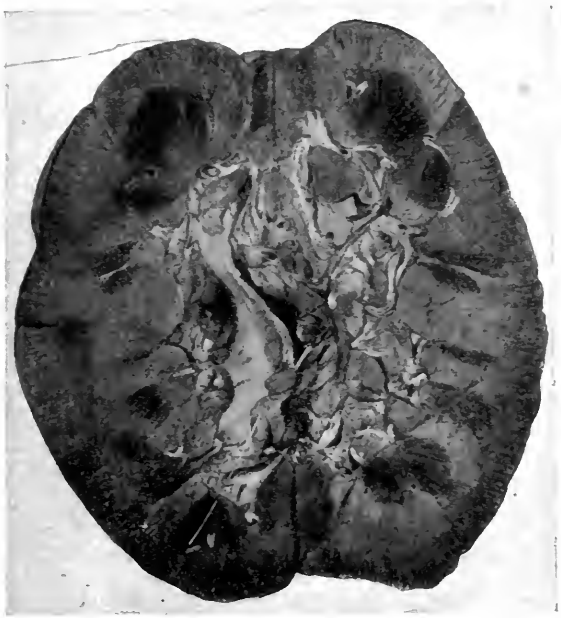

FIG. 12.—Compensatory hypertrophy of the single functionating kidney.

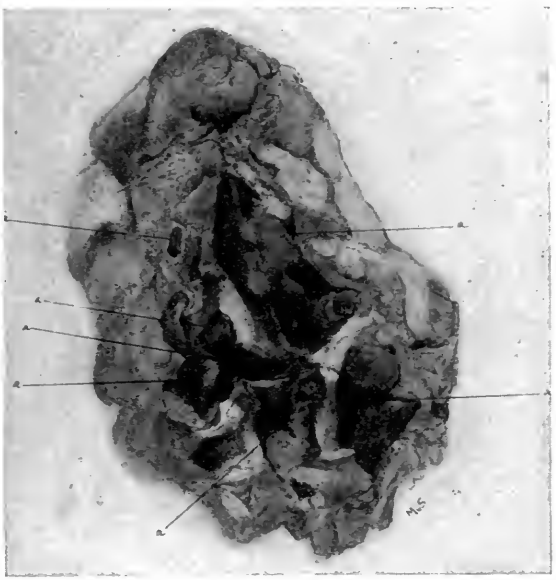

FIG. 13.—Remnant of a kidney from which several stones had been removed, leaving a suppurating urinary fistula, necessitating nephrectomy. Natural size.

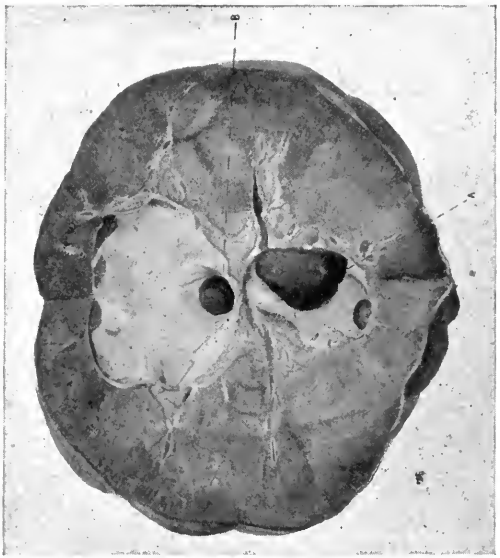

FIG. 14.—Two stones in the pelvis of the kidney. Stones at *A* and *B*. Post mortem specimen.

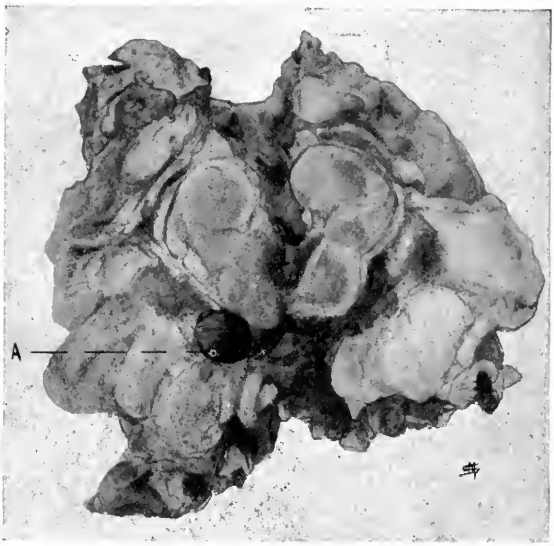

FIG. 15.—Total destruction of the diseased kidney as a functionating organ. Kidney reduced to a mass of inflamed fatty tissue containing a stone at *A*.

escaped for weeks from the incision; a small stone in the ureter was finally expelled, and after removal of the hydronephrotic sac, complete recovery.

H. Secondary hemorrhage after nephrolithotomy.

Civil engineer, aged forty years, with stones in both kidneys. One side had been operated on. At second operation on other kidney, stones removed by nephrolithotomy. On eighth day severe secondary hemorrhage and final recovery. Patient died later in third operation in the hands of another surgeon, during an attempt to remove remnant of kidney first operated upon (Fig. 13).

I. Stone ulcerating into duodenum.

Young man, aged twenty-five years, had abscess in loin opened as lumbar or psoas abscess. Pus and urine escaped from fistula. *X*-rays showed stones. The fistula was surrounded by a mushroom-like mass of granulations with multiple openings, discharging fetid pus and urine. Operation: Nephrectomy of infected kidney remnant containing stones. This was embedded in a mass of dense connective tissue, as though the kidney had been surrounded by a mass of plaster of Paris. Kidney remnant removed from within dense fibrous capsule. A horn-shaped stone had ulcerated its way into the duodenum (Figs. 14 and 16). Death from pulmonary hemorrhage on seventh day, due to infected infarcts of both lower lobes.

CONCLUSIONS.

The work of the last ten years has placed the diagnosis and treatment of kidney stone on an established basis. The diagnosis is determined by a process of exclusion and confirmed by the *x*-rays. When the diagnosis is definite, the treatment should be surgical removal, except in cases of small stones, which may be passed, or in cases of extreme age, or in the presence of organic lesions which strongly contra-indicate operation. In a single stone in the pelvis of a comparatively sound kidney, the operation of pyelotomy with closure is the operation of choice. In cases with large stone, and especially multiple stones, in both pelvis and calices, and in cases

with considerable infection, nephrolithotomy, with or without drainage, should be resorted to.

In cases in which stones are found in a kidney which is so altered as to be of little value to the patient, and where kidney sufficiency has been demonstrated and the other kidney is not involved, primary nephrectomy should be done. In primary stones involving but one kidney, pyelotomy and nephrolithotomy are comparatively safe procedures, carrying with them but from 3 to 4 per cent. of risk. Where both kidneys contain calculi, the dangers of the pathological condition and the operation for its relief naturally increases. And where, because of infection and destructive processes, nephrectomy is required, the dangers of the operation will depend upon the integrity of the other kidney and its functional capacity and the dangers resultant upon the surgical removal of the diseased organ.

In my own series of 52 operations done for kidney stone I have had but one death from nephrolithotomy and two deaths from secondary nephrectomies, both made extremely difficult because of the necessity of digging the kidney remnant out of dense scar tissue due to long-standing perinephritic inflammation. On the whole, we can today regard the diagnosis and treatment of kidney stone as one of the great triumphs of modern surgery, both from the standpoint of relieving suffering and saving life.

A LARGE KIDNEY STONE.

By DAVID BARROW, M.D.,
LEXINGTON, KY.

This kidney stone is of interest mainly on account of its size. Just after removal it weighed one pound and two drams; it is the largest I have seen, and I am unable to find but one, that described by Shields in the *Lancet*, October 15, 1904, weighing 570 grams, reported as large, removed by operation, although my search of the literature has not been exhaustive.

In the St. Bartholomew Hospital Museum there is a stone removed after death weighing thirty-six and one-half ounces, it was taken from the right kidney, and from the left was another that weighed nine and three-quarters ounces. The largest removed by Morris during life weighed ten ounces, and he had made about 100 operations for renal calculi up to 1898.

From a small piece, Dr. Louis Heitzmann made the following report: "Was of a grayish white color, brittle in character, and indistinctly lamellated. Under the microscope it was found to consist of variously sized plates of triple phosphates, that is, ammoniomagnesian phosphates, as well as of simple or calcium phosphates, alternating with each other. Chemically it dissolved upon being treated with hydrochloric acid without effervescence. The nucleus of the stone was identical in structure with the body and the periphery. The diagnosis is phosphatic calculus."

Wishing to preserve the specimen intact, the interior of the stone has not been examined, so I do not know the primary deposit, but beginning, as the history indicates, in early life, it seems probable that it is uric acid. The piece examined by Dr. Heitzmann was peripheral and its composition throughout was identical, but the

interior of that piece does not represent the nucleus of the main stone. With the primary uric acid deposit, in time infection occurred, causing the secondary phosphatic deposits.

Mr. D. J. W., aged forty-eight years, a patient of Dr. F. M. Greene, of Lexington, Kentucky, consulted me in November, 1905. He stated that he had never been strong, that at the age of eight he had had the first symptoms of some abdominal trouble, and that since, for forty years, he had never felt well longer than a few months at a time. During boyhood he averaged three or four attacks a year, described the pain as being intense, in the region of the left kidney, and lasting usually several days, always leaving the side sore and tender. At the age of fourteen, contracted "chills and fever," the type being irregular, which continued for one year, and were never controlled by quinine. After the chills and fever he improved in a general way, although he continued to have abdominal attacks every few months and was never strong or felt perfectly well. At the age of twenty, urinary symptoms appeared, and during the abdominal attacks he had to void urine as often as every half hour, at other times not so often, but always too frequently. Urination sometimes was quite painful, the urine often having a muddy appearance, and causing an intense burning in the penis. For ten years the symptoms continued without much change, the abdominal attacks being slightly more frequent. During this period he was unable to attend to his duties (that of a farmer), except in a most indifferent way, and was never able to do hard manual labor without causing a return of the pain. At about thirty the attacks began to be more frequent, often recurring in a month, and in the intervals there was more abdominal soreness, greater weakness, and more discomfort in getting about, and the urinary disturbance was nearly always present. A number of physicians had been consulted, and had varied opinions as to the trouble, but strange to say, no one seemed to consider the kidney at fault, or, at least, did not tell the patient so. He was given a great deal of medicine, and occasionally suffered so intensely that opiates had to be administered, but never to the extent of producing the habit. Ten years before consulting me, at the age of thirty-

eight, he noticed for the first time an enlargement in the left abdominal cavity just below the ribs, it was round and about the size of an orange, and not very sensitive to manipulation. For these ten years he gradually lost ground, got very thin, suffered more pain, had more evidence of sepsis, urinary discomfort became almost continuous, and the tumor increased in size slowly. For four years he

was practically invalided, unable to do any work on the farm, was confined to bed much of the time, and was being treated by the *x*-rays, with the belief that the abdominal tumor was an enlarged spleen. He consulted me first at my office, and the following observations were made:

He was five feet eight inches tall, weighed 120 pounds, his expression was anxious, complexion sallow, and there was every appearance of long-suffering and ill health. He looked markedly septic, and told me that he had slight fever in the evenings. His pulse was over 100, and he suffered with short breath on slight exertion. An examination of the chest organs revealed nothing abnormal. In the abdominal cavity, to the left of the umbilicus and extending up to and under the border of the ribs, was a hard, oval tumor, about the size of a cocoanut. It was firmly fixed and not affected by respiration, and there was but little pain on palpation. His bowels acted regularly, and at no time had he had any obstructive symptoms; the movements seemed normal and had never contained blood, but occasionally there was gaseous distention. The urine was normal in quantity, alkaline, and contained a large amount of pus and phosphatic debris; urination was frequent and painful, and a number of examinations for tubercle bacilli proved negative. There was no enlargement or tenderness of the right kidney, and at no time had there been any pain in the right side; an exploration of the bladder proved negative. There was no blood in the urine, and there was no history of ever having passed any. A diagnosis of pyonephrosis, probably of calculous origin, was made. He was sent to St. Joseph's Hospital, and operated upon December 16, 1905. After etherization, resting upon a loin pillow, an oblique incision was made from near the twelfth rib along the outer border of the erector spinæ muscle, curving forward a little above the crest of the ilium and Poupart's ligament. The tumor was firmly fixed and closely adherent to the perirenal tissues, which were hard and indurated, but was enucleated without great difficulty. The calculus occupied the pelvis, and as there was great destruction of the parenchyma of the kidney, I decided to do a nephrectomy. The pedicle was transfixed and doubly ligated with silk, the ureter was traced for about three inches, ligated with chromic catgut, and divided, so there was no escape of pus or soiling of the wound. The incision was closed with plain catgut, each layer being sutured separately; a rubber drain was inserted. The patient was but little shocked by the operation, and left the table

in fair condition. The secretion of the urine was abundant, it soon cleared up, and in a few days analysis showed it to be normal, confirming the opinion that the right kidney was in good condition. Convalescence was satisfactory, but the drainage tract was rather slow to heal, but at no time was there anything to cause special anxiety. In seven weeks after the operation he left the hospital, completely healed and gaining in every way rapidly. At this time, now more than two years, he weighs 152 pounds, seems perfectly well, and works every day on the farm.

RESULTS OF OPERATION ON THE KIDNEY FOR TUBERCULOSIS AND CALCULUS.

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THE final outcome of our surgical endeavors is apt to excite wider interest than does the immediate result of our operations. The latter may appeal more strongly to the surgeon, pure and simple, but the profession at large, and certainly the public, are more intensely interested in the final cure of the patient. The mortality rate of most operations is known with as great exactness as is possible, considering the differences in the personal equation of the operator and the general hygienic and domestic conditions of the patients. Less certainty, however, prevails as to the final results of our operations.

It is, therefore, my object in this brief paper to trace the future life history (1) of the patients from whom in past years a tuberculous kidney has been removed, and (2) to ascertain the future fate of the kidneys from which calculi have been extracted. In neither of these classes of cases has the writer's experience been very large, but it has seemed to him that the final results of his personal cases might be of some service in reaching conclusions on these two important problems.

TUBERCULOSIS. First, as to the prognosis of patients with a tuberculous kidney. Definite figures as to the probabilities of cure under hygienic and climatic treatment are impossible to reach. It is somewhat easier, perhaps, to reach, approximately at least, the results which follow the removal of such kidneys. We are often brought face to face with the troublesome question, Shall the kidney be removed? In many cases, of course, this question can be instantly answered. Because of an acute miliary tuberculosis, or

because of severe involvement of other organs, operation is at once judged to be inadvisable. On the other hand, the involvement of the kidney may be so slight that its removal does not seem indicated. Hygienic and climatic treatment appear preferable. This latter statement, I believe, may be questioned by a number of surgeons in this audience. We must all, however, acknowledge, I think, that there are many cases occupying a middle ground, where decision as to the proper course of treatment to be pursued is very difficult. Such decision should rest on conclusions which have been established from actual clinical experience. The more accurately we can answer the following two questions, the more logical will be our advice to these patients: (*a*) What are the chances for permanent cure of kidneys which have once been affected by tuberculosis? (*b*) What proportion of patients from whom a tuberculous kidney has been removed make a permanent recovery?

In answer to the first of these questions, the great majority of experienced surgeons believe that complete functional restoration of a kidney that has once been tuberculous is a very unusual occurrence. Garré states that while long-standing improvement may result from non-surgical treatment, yet it is doubtful if a true and lasting cure with recovery of the kidney has been accomplished. In this he is in accord with Israel, Schede, Albarran, etc. It is quite true that occasionally the tuberculous elements will entirely disappear from the urine of a patient who formerly had a tuberculous kidney, and after the lapse of a few years this excretion will be clear and normal. Autopsies have explained how, in some cases, at least, such a favorable condition results. The French have named the process *autonephrectomie.* The kidney as a secreting organ is practically or totally destroyed. Shrinkage has taken place, the tuberculous tissue being replaced by fibrous connective tissue, and the whole organ, with its pelvis, shrunken into a small, hard mass with obliteration of the ureter. Does this shrinkage and destruction of kidney tissue always occur in those patients whose urine has become normal? I do not know if there be any anatomical proof to the contrary. I personally believe, however, that it is quite possible for a kidney once the seat of small

tuberculous deposits to so far recover that it will excrete normal urine—the amount perhaps somewhat diminished. The following case is, I think, an example:

J. M. H., male, aged thirty-eight years, a school teacher. A family history of tuberculosis through several branches. For two years gradual and progressive failure of general health. Loss of flesh. For about the same length of time patient noticed that urine was cloudy, and that micturition gradually became more frequent, both by day and by night. In November, 1899, he noticed blood in his urine. This persisted about ten days. Examination of his urine at this time proved the presence of tubercle bacilli. Dull, aching pain, with occasional sharp exacerbations, was felt in his right loin. These symptoms, with increasing failure of health, persisted until he entered the Presbyterian Hospital, May 26, 1900, for operation. The right kidney was freely exposed and carefully inspected. On its surface were seen a number of whitish spots, many the size of a millet seed, and a few irregular patches with a diameter of perhaps one-half inch. The organ was slightly enlarged. No caseous or broken down areas could be discovered and the consistency of the organ was regular and comparatively normal. The decision was reached that it was too good a kidney to remove, especially as it was possible for the patient to lead an outdoor life for as long a time as was needed. The organ was, therefore, replaced without an incision or traumatism of any kind being made. Recovery from the operation was rapid. The patient has since led a hygienic outdoor life, and rapidly regained and increased his weight. He has enjoyed perfect health for the past seven years. Micturition is normal in frequency. The urine is perfectly clear and normal in amount, containing no trace of either albumin, pus, or tubercle bacilli. Eight years have elapsed since the operation, and I think, the patient can be considered cured.

In answer to the second question, as to the number of recoveries after nephrectomy for tuberculosis, there are more facts at our disposal from which we can draw legitimate conclusions. The experience of Israel[1] has been by far the largest. He reports 94

[1] Centralbl. f. Chir., 1907, No. 15.

nephrectomies for tuberculosis. Out of 70 of the surviving patients whom he had been able to follow, marked improvement with decided increase in body weight had resulted in 47. He was able to report 15 of these patients as alive and apparently cured, at periods from five to fifteen years after the nephrectomy. It is of interest to note that in not a single instance, where the remaining kidney was healthy at the time of operation, did it later develop tuberculosis. Facklam[1] collected 88 cases where nephrectomy had been performed for tuberculosis. Of these, 14 patients were well at the end of more than three years after their operations. Schede[2] reported 25 similar cases, with 9 recoveries. Out of 54 nephrectomies which I have performed for various causes, 19 have been done for tuberculosis; of these, 2 patients died before leaving the hospital (1 on the tenth, and 1 on the twenty-first day).[3] There were no fatalities due to shock. Of the 17 surviving patients, I have been unable to trace two of them (the population of New York City is so migratory that the tracing of the hospital patients is always extremely difficult). Five of these patients have apparently made a permanent recovery: One patient well at the end of nineteen years; 1 at fourteen years; 1 at twelve years; 1 at eleven years; 1 at nine years. Two other patients are apparently free from any tuberculous disease at the end of four years and two years, respectively, but I have preferred to judge of results only after the expiration of five years from the date of operation.

Of the other eight patients, 1 died in twelve months from general tuberculosis; 1 in twenty months from general tuberculosis; 1 in fifteen months from an accident; 1 in eighteen months from pneumonia; 1 in twenty-three months from pulmonary tuberculosis; 1 in thirty months from some wasting disease, nature unknown; 1 in thirty-six months from tuberculosis of the remaining kidney; 1 in thirty-eight months, with symptoms of nephritis.

Judging from the above statistics of 226 nephrectomies, with 53 apparent recoveries, and adding to these 100 other cases which I

[1] Arch. f. klin. Chir., 1893, Band xlv.

[2] Bergmann's Handbuch des Praktisch Chirurgie.

[3] Two other operations have been performed within the past two years, and are not mentioned in these statistics.

have collected from other sources, we may conclude, I think, that about 20 per cent. of those patients from whom tuberculous kidneys have been removed have made permanent recoveries. In this connection, it should be borne in mind that many of these patients were in an advanced stage of tuberculosis; indeed, in a certain proportion the chances for radical cure could scarcely be even imagined. In this respect, recent years have wrought an improvement, for patients are now brought at an earlier stage of their disease to the surgeon. Methods for the determination of tuberculous disease in the urinary organs are also much improved. We may therefore hope that in the future the results of operations may show a more favorable ratio than that of one in five.

The histories in brief of the patients who have made a permanent recovery are as follows:

CASE I.—J. H., male, aged thirty-two years. For three years urinary symptoms. Frequent urination and colicky pain in left loin. Urine often contained "matter" and blood. Operation, October 26, 1889. Nephrectomy. Large kidney, with many small, broken-down tuberculous deposits. Good recovery. At end of nineteen years patient was in excellent health, with normal urination.

CASE II.—E. M., female, aged thirty-eight years. For several years miserable. Dull pain in left loin. Later, frequent urination, and mass appeared. Kidney large and tender. Urine contained pus and blood. Operation, May 24, 1893. Nephrectomy. Caseous tuberculous deposits and pus pockets. Slow recovery, but in May, 1907, is perfectly well and urine normal.

CASE III.—A. B., female, aged twenty-nine years. For two years had suffered from vague pains in right loin. Urination frequent, especially at night. Blood seen in urine. Kidney enlarged and tender. Tubercle bacilli, blood, and pus in urine. Operation, October 29, 1895. Kidney large, contained several tuberculous deposits. Good recovery. Reports herself, May, 1908, as in good health, with normal micturition and urine free from abnormal elements.

CASE IV.—E. C., female, aged thirty-seven years. For eighteen months dull pain in right loin, frequent urination and marked loss

of flesh and strength. Kidney enlarged and tender. Operation, July 6, 1887. Nephrectomy. Large kidney, with three tuberculous foci. Slow recovery. For three years remained feeble and then regained her health. At end of nine years strong and well. Urine normal.

CASE V.—N. C., male, aged fourteen years. For 2 years frequent micturition and pain in right loin. Urine contained tubercle bacilli, blood, pus. Operation, August 30, 1896. Nephrectomy. Tuberculous deposits throughout kidney. Good recovery. At the present time, May, 1908, patient is well and urine normal.

CALCULI.

It has seemed wiser not to discuss in this paper all my cases of operation for renal calculi (45). If the cases which were complicated by septic or pyonephrotic conditions were included, I fear that attention might be diverted from the main object, that is, the behavior of those kidneys whose main lesion was the pyelitis due to the presence of a stone. I have performed 15 operations of this character. In 12 the stone was situated in the renal pelvis and in 3 in the ureter. I have endeavored in these patients to trace the final results, both as to their general health and as to the ultimate condition of their kidneys. Of the 15 patients, we know that 12 have made a perfect recovery. In one case, the history of which I will briefly relate, nephrectomy on the twenty-sixth day was required because of renal hemorrhage, which began on the twenty-first day after operation.

In one the kidney symptoms never disappeared, and nephrectomy was needed four months after the nephrolithotomy. One patient has not been found. Twelve patients have practically recovered their health, in 1 only there being still occasional pain and abnormal urine. In the other 11 patients there is no trace of bad symptoms attributable to the kidney, and the urine is normal.

In connection with the operation of nephrolithotomy, there is one point of special interest. Shall the calculus be extracted through an incision made in the pelvis of the kidney, or through one made in

the parenchyma of that organ? There can be no categorical answer to this question, for there are stones lying in the pelvis of the kidney which are so great in size that extraction through the parenchyma of the kidney would be unwarranted because of the necessary injury of tissue during their removal. On the other hand, there are stones with tapering processes running up into the calices, for the removal of which the kidney must necessarily be incised. Given, however, a small or moderate-sized stone situated in the pelvis, how shall it be extracted? My original practice was to extract it through an incision made in the pelvis directly down on the stone. In later years, however, influenced by the teaching of most surgeons, it has become my practice to split the kidney and remove the stone directly through the incision in its parenchyma. The incision in the kidney is then closed by fine catgut sutures. I have found but little inconvenience, and never any danger, from hemorrhage. While the kidney is held in one hand the incision is made with the other, and thus all bleeding can be perfectly controlled during the extraction of the stone. The incision is at once sutured with interrupted sutures of fine catgut placed about three to the inch, and tied loosely, so that kidney parenchyma may not be damaged by constriction of the sutures. This method of suturing has invariably controlled the bleeding. Fine catgut, which will last but a few days is employed, so that if the tension in the pelvis be too great, the kidney may burst open, and so relieve itself externally. In but 1 case in 7 has this occurred. In cases where the question of drainage has been in doubt the kidney is more lightly sutured than in cases where drainage is clearly unnecessary. While my cases are not sufficiently numerous to throw much light on this question, yet it is suggestive that in 5 patients, where the incision was made in the pelvis, leakage occurred in 4. In 6 patients, where the incision was made through the kidney itself, leakage occurred in one only. It is not quite fair, however, to judge from these figures that leakage of urine is less apt to follow incisions in the kidney rather than those in the pelvis, because in several patients the wound in the pelvis was but lightly sutured in anticipation of future need of external drainage, whereas, the wound in the kidney was always thoroughly

closed by suture. It is my impression, however, that there is less danger of leakage when the stone is extracted through the parenchyma of the kidney.

In the majority of patients suffering from nephritic calculi either the pyelitis is so severe, or the kidney itself is in a state of advanced pyonephrosis, that all question of closure of the kidney is at once settled. External drainage is necessary. There are, on the other hand, patients where the kidney itself appears comparatively normal and where the pyelitis is comparatively slight. Drainage seems, under such conditions, to be quite unnecessary. We will always, however, encounter a few cases where it will not be easy to decide whether or not to employ drainage. In all cases we must be sure that the ureter is patent. Drainage is indicated if there be any sign of disorganization of the kidney itself or if the calices be much distended, or should the urine have been loaded with pus prior to the operation, or should there have been at any time fever or signs of sepsis, or if much damage has been done to the kidney during the extraction of the calculus, or should there have been crumbling of calculus during the process of its extraction, as under these circumstances some small fragments might have been left behind in the calices. Should there be doubt as to the wisest method of procedure, a compromise may be made and the kidney very lightly sutured with fine (oo) catgut. Should the inflammation of the pelvis persist in such severe form as to demand drainage, nature will come to its relief and burst open the sutured kidney, as occurred in one of my cases. (Case XI). Renal hemorrhage occasionally follows the operation of nephrolithotomy. Such hemorrhage may immediately follow the operation, or occur only after the expiration of some days. Thus, Israel, in 131 nephrolithotomies, experienced bleeding so severe as to necessitate tamponage of the kidney in 12 patients. The closure of the kidney by sutures is a safeguard against such hemorrhages. In the one case in my own experience bleeding was of the late variety. Sutures in the kidney itself had not been employed. Nephrectomy was necessary.

CASE I.—M. B., female, aged twenty-eight years. For thirteen years she had suffered from more or less constant dragging pain in

her right loin. Colicky pain on a few occasions only. No fever. Micturition frequent, sometimes painful. Urine contained 8 per cent. pus and many blood cells. Operation, January 6, 1888. Kidney exposed and brought into wound; stone felt in its pelvis. The stone was directly cut down upon by an incision in the pelvis of the kidney. A mulberry calculus the size of a small walnut was removed; weight, 120 grams. The wound in the pelvis was loosely sutured, and the wound closed except for a rubber drainage tube leading down to the kidney. Leakage of urine followed, and persisted for sixteen days. In another fortnight the wound was closed. Recovery was rapid, and for ten years following general health was excellent and urine normal.

CASE II.—J. B., male, aged forty-seven years. For several years had suffered from attacks of colicky pain in left loin. Micturition had been frequently painful, and he had noticed blood in his urine. His left kidney was palpable and tender. Urine contained pus and blood. Operation, November 2, 1890. Kidney considerably enlarged and adherent. Stone the size of a hickory nut felt in the pelvis. Incision made through the kidney pelvis, and stone extracted. Wound in pelvis loosely sutured with catgut; rubber drainage tube to kidney. Urine discharged from the wound for eleven days after the operation. Wound was healed on the twenty-seventh day. Patient up to the present time has remained perfectly well; is free from pain, with normal micturition and urine.

CASE III.—S. M., female, aged twenty-three years. For seven years occasional colicky attacks of pain in left loin, accompanied by vomiting and fever. Blood noticeable in urine, which contained also pus. Left kidney large and tender. Great nervousness. Operation, May 7, 1892. Kidney enlarged and slightly adherent. Stone felt in pelvis. Incision in dorsum through parenchyma to pelvis. Rough "mulberry" stone extracted, size of large pea. Kidney sutured with catgut, "cigarette drain;" good recovery; no leakage of urine. Since operation patient has enjoyed perfect health, and urine is normal (May, 1908).

CASE IV.—J. R., female, aged thirty-four years. For two or three years had suffered from attacks of colicky pain in left loin,

always attended by frequent and painful micturition. Occasionally fever, with nausea and vomiting. Urine contained considerable blood and a few pus cells. Operation, August 12, 1893. Kidney deeply situated. Stone felt in its pelvis, through which an incision was made. The extracted stone was very rough, as large as a hickory nut. The wound in the pelvis was closed by catgut sutures; a rubber drainage led down to the kidney. No leakage of urine followed. The wound was closed on the twenty-seventh day. For seven years the patient was observed, and during that time was in good health, with normal micturition. The urine for fifteen months after the operation contained a few pus cells and then became normal.

CASE V.—J. S., male, aged thirty-one years. For a number of years patient had noticed frequency of, and occasional pain on, urination. He had also at times experienced some colicky pains in his left loin. The left kidney region was tender on pressure. Urine contained some pus and blood. Operation, January 7, 1894. The kidney was considerably enlarged. An irregular stone the size of an almond was felt in the pelvis, with two branches running up into the calices. An incision made through the pelvis rendered the extraction of the stone comparatively easy. The wound was lightly sutured with catgut. A rubber tube was passed down to the kidney. Leakage of urine followed and persisted for nineteen days. The wound healed slowly and was not cicatrized completely until the thirty-seventh day. For six months after leaving the hospital the patient was in fair health. His urine, however, continued to have pus. His lumbar pain then returned, with slight attacks of fever. His kidney became tender. Four months later the kidney was enlarged and very tender. Nephrectomy was then performed. In the calices of the kidney two other small stones were found buried, and the kidney was in a condition of pyonephrosis. Recovery was uneventful.

CASE VI.—L. S., female, aged twenty-seven years. For one month had suffered from dull aching pain in right loin and two severe attacks of colicky pain. Frequently noticed strangury. Once saw blood in her urine. Urine contained a few pus cells and

numerous red blood cells. Operation, November 17, 1896. Kidney was easily brought into wound. A small stone felt in the pelvis. Extracted through an incision made through the kidney parenchyma. The kidney was closed by interrupted sutures of catgut. The lumbar wound was closed with the exception of an opening for a drainage tube. No leakage of urine followed. Wound was healed on the twenty-third day.

CASE VII.—A. B., female, aged thirty-seven years. For two or three years frequent and painful micturition. Dull ache in right loin. Loss of flesh and strength. Urine contained blood and pus. Operation, March 13, 1898. Kidney slightly enlarged. Stone size of almond felt in pelvis. Incision through parenchyma of kidney. Stone easily extracted. Incision in kidney closed with catgut sutures. Primary union. No leakage of urine. Rapid recovery. Ever since operation patient has enjoyed good health, and urine is normal (May, 1908).

CASE VIII.—M. S., male., aged twenty-two years. For thirteen years had suffered from attacks of colicky pain in right loin. Micturition increased in frequency. Urine contained a few pus and red blood cells. The *x*-ray photographs showed a distinct shadow in the region of the right kidney. Operation, April 2, 1904. Kidney deeply situated. Could not be drawn into the wound. Incision made partly through the pelvis and partly through kidney parenchyma, directly down upon a large branching stone. The branches ran up into the calices, and the kidney substance was somewhat torn in their extraction. On account of the bleeding a strip of gauze was passed into the opening in the kidney, the pelvic part of the incision being closed by suture. The urine continued to discharge from the wound for thirty-five days. The wound was completely healed at the end of five weeks. The patient has since enjoyed excellent health, and at the end of four years reports himself as perfectly well, free from pain, with normal micturition and urine.

CASE IX.—M. M., female, aged fourteen years. For five years had suffered from frequent attacks of pain in right loin. More or less nausea and vomiting during attacks. Occasional chill, fever, and sweating. Micturition nearly always painful and frequent.

Urine contained a small amount of pus and a few red blood cells. *X*-ray photograph showed distinct shadows in region of right kidney. Operation, May 25, 1905. Kidney exposed; appeared congested and more adherent to its fatty capsule than is normal. Several stones felt on palpation. Kidney cut open and finger passed into a somewhat dilated pelvis. The largest stone lay in the pelvis, shape oval, size $\frac{1}{3}$ x $\frac{1}{2}$ inch. Five smaller stones felt in the apices of the calices were extracted. Another small stone was then felt in the ureter, three inches below the pelvis. This was milked back and extracted through the kidney. The probe in the ureter then encountered an obstruction near the bladder. With slight pressure this gave way, a small stone being apparently pushed into the bladder. The kidney and its pelvis were irrigated with salt solution. The wound in the kidney was then closed by a row of interrupted sutures of fine catgut very loosely tied. The lumbar wound was closed in layers throughout, except for a small opening through which a thin "cigarette drain" passed to the kidney. Primary union resulted, no leakage of urine. Convalescence was uninterrupted. Since leaving the hospital at the end of three weeks, the girl has been perfectly well; three years have now elapsed. There has been no pain. Micturition has been normal, as is also the urine.

Case X.—R. S., female, aged twenty-three years. For ten years attacks of severe pain in right loin at irregular intervals, associated with nausea and vomiting. Micturition often painful. Urine contained a few pus cells, and a trace of red blood cells. The *x*-ray photograph showed two distinct shadows in the region of the right kidney. Operation, December 5, 1905. Kidney exposed and incised; two stones felt in its pelvis. Kidney opened on its convex surface, down to the ureter. Two stones removed, one the size of a small walnut, the other of a pea. Kidney wound sutured lightly with interrupted sutures of fine catgut. Lumbar wound closed except for a small "cigarette drain." Primary union of the wound. No leakage of urine. Convalescence rapid. The girl left the hospital on the nineteenth day after operation, and since that time, two and one-half years ago, has been perfectly well. Micturition normal, as is her urine.

CASE XI.—S. C., female, aged thirty-seven years. For several years (five or six) had suffered from attacks of colicky pains in right loin, accompanied by nausea and vomiting. Micturition painful and frequent. Fever generally accompanied the attacks. The pains, gastric disturbances, and fever had caused marked loss of flesh and strength; and patient had become very weak. Urine contained a few pus and red blood cells. The *x*-ray photograph showed two shadows in region of right kidney. Operation, October 23, 1906. Kidney enlarged, slightly adherent, and looked congested; two stones felt in the pelvis. Incision through kidney substance from dorsum into its pelvis. The two stones, each the size of a large pea, extracted. The wound in the kidney was closed with a few fine catgut sutures. Lumbar wound closed except for a small "cigarette drain." The patient was very weak for some days following the operation, and developed slight fever. On the sixth day, the finger was passed through the drain sinus, down to the kidney. A few hours later there was a discharge of urine, and the temperature slowly fell to normal. Urine continued to discharge from the sixth to the twenty-second day. The wound was closed on the thirtieth day, and the patient returned to the country on the thirty-seventh. Her improvement was slow and tedious, but at the end of six months she had practically regained her health. Her urine slowly improved, and at the end of a year was normal in every respect. It is now eighteen months since her operation, and her health is quite restored.

URETER STONES.

CASE I.—L. M., male, aged thirty-three years. For eight or nine years patient had complained of occasional colicky pain in left side of abdomen. Attacks were accompanied by frequent urination or strangury. On several occasions blood was noticed in the urine. Tender spot just internal to anterior superior iliac spine. Patient often felt intense pain at this point. Operation, December 14, 1900. Incision intermuscular, just internal to anterior superior spine of ilium. Peritoneum stripped from iliac bone, and finger soon felt

the stone. The ureter was easily isolated, and an incision was made directly on the calculus, which was the size of a large oval pea. The ureter wound was closed by interrupted catgut sutures. A strip of rubber tissue passed down to the ureter wound. No leakage. Primary union. Patient has ever since been free from pain, and urine is normal.

CASE II.—C. S., female, aged forty-three years. For fifteen years or more patient had suffered from colicky pains in right loin. In past six months pains had apparently started from a point below her anterior superior spine. An *x*-ray picture showed a faint shadow just below McBurney's point. Operation, April 17, 1902. Incision intermuscular, just below anterior superior iliac spine. Peritoneum stripped from wall of pelvis, and finger rapidly located a hard body situated near the brim of the pelvis. The ureter was isolated, and through an incision in its wall a stone $\frac{1}{2} \times \frac{1}{3}$ inch was easily extracted. The wound was closed by interrupted catgut sutures. A strip of rubber tissue passed down to ureter. No leakage. Patient has been well ever since, and her urine is normal.

CASE III.—D. N., male, aged thirty-eight years. In 1895 an abscess of the kidney had been opened and drained. Condition at that time very grave, and severe illness lasted many weeks. Since that time health never good. Indefinite pains in pelvis and right lumbar region. Bladder very irritable. Occasional severe attacks of fever and scanty urine. Urine frequently contained pus and blood cells. *X*-rays showed a shadow on right side, internal to anterior superior spine of ilium. Operation, June 17, 1905. Ureter found embedded in dense cicatricial tissue. Opposite the iliac crest a small irregular stone was felt. The ureter was incised and a calculus three-eighths of an inch in diameter extracted. The incision in the ureter was closed by three sutures of fine catgut. The wound was closed except for a "cigarette drain." Convalescence was normal. Health slowly regained. The patient is at the present time, nearly three years since his operation, enjoying excellent health. His urine is normal.

DISCUSSION ON THE PAPERS OF DRS. VAUGHAN, BEVAN, BARROW AND McCOSH.

Dr. Leonard Freeman, of Denver, Col.

In operating for stone in the kidney, whether the kidney substance should be incised, or the pelvic route selected, must depend upon the character of the case. Personally I prefer to cut through the parenchyma of the kidney. The bleeding that is sometimes produced can be easily controlled by the use of gastro-enterostomy forceps having their

flexible blades covered with rubber tubing. By raising the lower pole of the kidney slightly, these forceps, which are curved, can be carried in over the pedicle of the kidney and clamped lightly. After the stone has been removed, and the suturing done with catgut, the forceps can be loosened, and it can be seen whether or not there is bleeding. If there is, the forceps can be re-clamped and the suturing more thoroughly done. These forceps do not embarrass the manipulations of the operator

to such an extent as if the kidney were held with the hand, and they also serve to push the kidney forward into the opening so that it can be more easily reached.

I wish also to refer to those apparent calculi which occur in *x*-ray pictures of the ureter, and which Dr. Bevan has so interestingly spoken of. He explains that they are probably points of calcification in the ligaments of the pelvis. They might also be calcified lymphatic glands,

or, possibly, phleboliths. I have here an *x*-ray picture which illustrates this form of "pseudocalculus" nicely (see illustration). The diagnosis was extremely difficult. The man had passed, at a previous time, a calculus from the left kidney. He retained the stone, so there was no doubt. While on a trip he had severe pain over the appendix. No physician saw him, and the history came entirely from him. An *x*-ray examination showed one of these little round concretions apparently in the right

ureter. In order to settle the point the ureter was catheterized with a wire in the catheter, and the *x*-ray picture shows the small stone and also shows that it lies half an inch or an inch from the wire in the catheter; hence it could not be a ureteral calculus. I have also another *x*-ray picture which illustrates the same thing. One of these shadows, about the size of a pea, exists close to the bladder (see illustration). This *x*-ray illustrates also the manner in which tuberculosis of the bladder is sometimes cured. Five years ago this man had extensive tuberculosis of the bladder and of the right kidney. The diagnosis was made in New York by the cystoscope. He came to Colorado. When I saw him a short time ago he showed no evidence of tuberculosis of the kidney, but had some trouble with the bladder. The *x*-ray picture shows an enormous shadow in the pelvis, which was supposed to be a stone in the bladder, but a suprapubic cystotomy revealed it to be a completely "calcified bladder." It was impossible to entirely remove the stony substance, because it was incorporated within the bladder wall. On one side can be seen one of the little round shadows mentioned by Dr. Bevan.

Dr. George E. Brewer, of New York.

I think this paper of Dr. Bevan is a timely one. In our most modern text-books we find that the diagnosis of kidney stone is described in the same old words. We must look for renal colic, hematuria, tenderness, and various other symptoms always considered classical. Now, as a matter of fact, all of us who have done work of this kind know that there is no sign, or no symptom, or no group of symptoms or signs, absolutely pathognomonic of stone. There are so many conditions which are simulated closely, and so many chances of error, that we must admit that the diagnosis of stone in the kidney is often a very difficult matter. Of all the symptoms and of all the signs and of all the helps we have, I believe, with Dr. Bevan, that the *x*-ray is the most important; but we must insist upon the points laid down. We must insist on a good plate. A plate which shows simply an indefinite shadow of the spine or of the pelvic bones is of no value whatever. We must have a plate showing the outline of the psoas muscle, the transverse processes to their tips, and the structure of the bodies of the vertebræ. When we have a plate like that we can make a negative as well as a positive diagnosis. One or two sources of error are those small points over the ureters. I have made a mistake in such a case in the use of the stylet catheter in a patient showing distinct renal symptoms. Cutting down upon the ureter, feeling sure I would find a stone, I cut down upon a perfectly normal ureter in which the catheter passed up and down without any trouble. Upon opening the peritoneal cavity I found a tumor-shaped mass

attached to the peritoneum over the ureter, which was found to be a calcified appendix epiphorical. I believe the majority of these shadows mistaken for stone are calcified bodies in the sacral ligaments.

One other possibility is illustrated in the case of a man with history of renal trouble, with a shadow perfectly distinct over the region of the kidney almost as large as an English walnut, and with perfectly defined edges. This was found to be a kidney absolutely destroyed by tuberculosis. There were three cavities, two containing pus, the one in the centre containing cheesy material, with a calcareous lining of the cavity.

One other point in regard to the small stones over the course of the ureter is that I have never removed such a stone or seen one removed which was not slightly oblong. The shadows of ligamentous ossification shown are perfectly round.

DR. NATHAN JACOBSON, of Syracuse, N. Y.

I want to speak first of the value of confirming, by means of the *x*-rays, the diagnosis of stone in the kidney. Personally I owe a great debt of gratitude to Dr. Bevan. Two or three years ago he came to Syracuse. Up to that time we had gotten very unsatisfactory results from our *x*-ray work in this field. He demonstrated the importance of certain details in the technique, and since then we have never been misled, but have made repeated confirmatory diagnoses with the *x*-rays. I have here a series of positive plates. These were made so as not to risk breaking the negatives. These plates, taken from ten patients, show oxalate of lime, phosphatic and uric acid stones, and two of them bring up questions as to the nature of some deposits concerning the character of which there may be some doubt.

One plate is that of a large calculus in which we were misled as to the presence of a second kidney. Using Harris' segregator, we apparently got a like amount of urine from each kidney. Thirty hours before operation, anuria appeared, and so, despite extensive destruction of the kidney, we were content to do only nephrolithotomy. The patient, a boy, aged seventeen years, succumbed two months subsequent to operation. Autopsy showed but one kidney, and that the one from which we had removed the stone. In but one of our plates have we found there were stones in both kidneys. Only the right kidney was opened. Another is from a case in which our diagnosis is that of phleboliths in the kidney. A probe passed into the ureter indicates its course and demonstrates that the calcareous deposits are not in the urinary channel. Another plate shows no calculus in the left side, where pains simulating renal colic had been suffered, but there appear to be foreign bodies in the appendix. In none of these cases was a diagnosis made from a single plate, but

was confirmed by repeated pictures. The exposure was not to exceed ten seconds.

Another point to which I wish to refer is one which I have but once encountered. It occurred in a child, aged five or six years, who had been under treatment by one of my confrères for cystitis. After the bladder had been repeatedly irrigated by him, during a period of about six months, the doctor on one occasion introduced a catheter into the bladder distended with urine, but failed to get any. I operated the same afternoon, doing perineal section. As soon as an opening was made, a perfect cast of the bladder was discharged. The catheter had evidently been inserted between the exudate which formed on the lining of the bladder and the bladder wall, it being a case of exudative or proliferative cystitis. The child did well for a few days, when anuria developed, and death followed. Autopsy showed both kidneys absolutely filled with stones. The diagnosis was cystitis associated with double nephrolithiasis.

Dr. C. B. G. de Nancrède, of Ann Arbor, Mich.

It has been borne in upon me that it is very advisable not to trust to any one symptom; that we have no right to make a diagnosis of stone in the ureter or kidney by the *x*-rays alone. Within a very short time I have had the following experience: A case was sent to me with apparently renal symptoms, with what the *x*-rayist—a very expert man—claimed to be a stone in the ureter above the crest of the ilium. It looked to me, from the anatomical standpoint, to be out of the line of the ureter. With the ureteral catheter with a stylet I found it to be over an inch external to the course of the ureter. Catheterization showed no obstruction up to the kidney pelvis, but on either side, in what might be called the lumbar portion of the ureter, were three round bodies that were about the size of a double "B" shot. There was absolutely not a single symptom of renal trouble. What these bodies were I cannot tell. Dr. Brewer calls attention to the fact that ureteral stones are usually not round, but ovoid. The absence of renal symptoms made me decline to operate.

I have not heard discussed, but doubtless it is incorporated in Dr. Bevan's paper, the question of the possible mistake of saying a stone is not in the kidney or ureter, on account of its chemical composition. I have never seen a pure urate stone in the kidney or ureter, but I recently saw in the bladder, and removed, quite a large stone that was entirely formed of urates. Several *x*-ray plates showed not the slightest trace of any stone. Its detection with the cystoscope was readily accomplished, and it gave a click on contact with a metal instrument. Most stones contain, with the urates, some phosphatic, uric acid, or oxalate deposit, which gives us a shadow. I should like to ask Dr. Bevan whether, in his

small percentage of failures to find by the *x*-rays a stone in the kidney or ureter, the composition of the stone was determined. I think this illustrates the danger of relying upon one sign alone. Of course the Fellows of this Association would not do that; but our discussions are read very extensively by members of the profession, and influence, far more than we think, the actions of the general practitioner. I was very much blamed for not operating for ureteral stone once when there was blood in the urine, where there were so many leukocytes and of such a character that they were declared to be pus cells—and I am not quite sure they were not—when the most expert *x*-rayist in our section of the country sent me down a most beautiful *x*-ray plate, which I still have, showing all the points that Dr. Bevan claimed, and what the *x*-ray operator claimed were two ureteral calculi. Anatomically I did not see how they could be in the ureter. I declined to operate. In my absence my assistant operated for what I believed to be present, an inflamed appendix. It was found to be so adherent over the site of the ureter that it was almost impossible to remove it. We all know that the *x*-ray method of diagnosticating stones in the ureter is a comparatively new thing. These facts, I have no doubt, Dr. Bevan has brought out in the portion of his paper which he has not read. I do not think those of you who live in large cities know how much the general practitioner relies upon the reports in the journals of what we say and claim to have done, hence my cautionary remarks.

Dr. Ellsworth Eliot, Jr., of New York.

I wish to confirm what Dr. Bevan and others have said regarding occasional osseous development in the ligaments of the pelvis. I would also call attention to the fact that these osseous foci are generally multiple, and are not all situated in the linear axis of the ureter.

In the second place, I wish to emphasize the frequent atypical character of the symptomatology of renal calculus. On a former occasion a personal analysis of a considerable number of these cases demonstrated that hematuria was present less frequently than it was absent, and that other symptoms as well are very variable in character, and that the most constant symptom is lumbar pain. That even this last-mentioned symptom may be absent is shown by a case of recent observation, in which, without prior symptoms, an examination conducted by a life insurance official revealed a small amount of purulent material in the urine. Subsequent cystoscopic and *x*-ray examination showed a calculus in the left kidney as large as an English walnut. The absence of this symptom in this case was all the more remarkable because of the extensive perinephritis that made the exposure and enucleation of the kidney most difficult. The absence of prior symptoms might possibly

be explained in part by the fact that the calculus was encysted in the kidney tissue itself. Enucleation of the calculus could be made only through an incision in the parenchyma. It is my practice to reach the calculi through an incision in the pelvis whenever that is possible. In these cases leakage has sometimes occurred, but never after the forty-eighth hour.

Dr. Joseph Ransohoff, of Cincinnati.

Personally I never have an *x*-ray made in a kidney case until the case has been studied thoroughly in a clinical manner. I use the *x*-rays only to confirm the diagnosis. It is a pity that the *x*-rays in this work have been introduced after the discovery of kidney tumors, because to that extent it has reduced our ability to make diagnoses from symptoms alone. We ought to exercise our mental capabilities to their utmost extent, and develop them in that way. For that reason I do not have an *x*-ray plate made unless the case be exceedingly urgent, until I have exhausted all clinical methods of examining the case. It must be borne in mind that many persons cannot have the *x*-rays used at once or early. The general practitioner who lives in the country has not these facilities. Therefore I think there should still be much attention paid to the clinical symptoms. One symptom, which I believe to be absolutely characteristic of stone in the kidney, is persistent, continuous, microscopic hematuria. In an interesting case seen six or eight months ago the symptoms were those of stone, and there was microscopic hematuria, although to the naked eye the urine looked perfectly clear. The *x*-rays showed the transverse process, etc., but no stone. A second series of *x*-ray pictures were taken some time afterward and the stone revealed. I would have operated upon this man six or eight months earlier, but delayed because the *x*-ray examination was negative.

Frequently small ureteral stone symptoms are known in persons upon whom operations have been done. Dr. Barrow will recall a case in which he had previously removed the uterine appendages, in which renal symptoms appeared, and we thought we had to do with stones in the ureter. The *x*-ray pictures showed in the pelvis on one side nine or ten round shadows in the region of the ureter on the right side. I have no doubt these were in connection with the ligatures which had been used.

An interesting point is that sometimes ureteral calculi produce no symptoms of obstruction. At the Southern Surgical Association I had occasion to show a ureteral stone, which was typically guttered. Of course it had the oblong shape, but there was a groove on one side so that the urine could pass without difficulty.

Dr. Freeman has spoken of controlling hemorrhage by the use of

forceps. I have no difficulty in controlling hemorrhage by holding the pedicle in the two fingers of the left hand while the examination is made with the right. I do not like the clamp, because it prevents the examination of the ureter. I never considered an operation on the kidney complete, whether or not the *x*-rays showed stone, without passing a catheter through the ureter along its whole length from the incision down to the bladder. I usually make the incision through the upper pole and another through the lower pole. I can get easily into the upper and lower pelves and make a thorough examination.

Dr. Maurice H. Richardson, of Boston.

Dr. Ransohoff anticipated what I want to say in the discussion of this subject, and what I should say also in the discussion of most of the subjects that come before us, namely, that the thing of importance is the diagnosis. One of our distinguished Fellows, a number of years ago, it is said, spoke of the surgeon as nothing but a tool in the hands of the physician, and said that he depended upon the physician to tell him what to do, and then did it. Although it was a humiliating position for the surgeon to accept, he could not deny that it was, to a certain extent, at that time really his position; and, so far as some diseases are concerned, it is his position today. The localization of a brain tumor is a special task, which few surgeons are fitted by education or experience to accomplish, but once the surgeon undertakes this work, and acquires especial experience in demonstrating the truth or falsity of his diagnosis, no man can compete with him in the refinements of his deductions. The surgeon has now accomplished so much in the abdomen that he is far from being dependent upon anybody for his diagnosis; he has acquired such remarkable skill in this special field that his accuracy cannot be surpassed or even equalled. I think I see evidence on all sides that the surgeon, who has ordinary opportunities for the cultivation of his powers, begins at last to appreciate the wonderful interest connected with internal diagnosis, and especially with diagnosis based wholly upon symptoms as described by the patient when objective evidence is entirely wanting.

What seems to me of the greatest value in our discussion is the candid personal experience of the Fellows, for our experiences differ so much. For example, Dr. Ransohoff has had little trouble with hemorrhage; I have had much, and the possibility of its occurrence is my greatest dread in renal stone. Although the results of my operations for stone in the kidney and ureter have been to me extraordinarily encouraging, yet, as I say, hemorrhage is the worst thing that I see in the approach to the pelvis of the kidney through the kidney tissue. When it was said at the time that nephrotomy for stone was first performed—as, indeed, it has been said at this meeting—that in opening the pelvis of the kidney,

by cutting through the parenchyma, the hemorrhage is trivial, I could not but wonder at the statement, for, after a few experiences of my own, I was forced to admit that hemorrhage is often alarming, persistent, and dangerous. Yet all my nephrotomies for stone have been ultimately successful, however much I have been alarmed at the time.

The question of diagnosis is to me one of the most interesting things in surgery. We, as surgeons, have opportunities for internal diagnosis which the physician can never have. In the first place he cannot *control* his diagnosis except by autopsy, unless he attends operations, and sees for himself the truth; and in my vicinity physicians seldom do this. True, they take our word for it; but that is not like seeing for themselves the exact pathological findings of the operation.

In renal stone the first symptom that attracts our attention is pain somewhere near or in the direction of the kidney tract. There is hardly any abdominal disease, acute or chronic, that is not preceded, accompanied, or followed by pain in some form or other. And in every case the onset, extent, severity, persistence—in fact, every attribute of pain except its visible effect upon the patient—depend upon the patient's description of it. In the early days of gallstone disease, unless there happens to be jaundice, we have to base the diagnosis entirely upon the patient's description of her pain. In renal stone the onset and character of the pain furnish the first and often the only clue. Unless the abdominal pain is correctly interpreted, the surgeon may attack the wrong organ or impose useless operation. I recall several cases of right ureteral calculus in patients operated upon for appendicitis, and the truth was not discovered or even suspected at the operation. I made the diagnosis subsequently by renewed consideration of the pain. The *x*-rays sometimes aided and sometimes obscured the diagnosis. I had, of course, the benefit of the first operator's experience, and knew that the pain was not appendicular.

Some years ago it was the custom of those of us who were particularly interested in diagnosis to "take the field" against a diagnosis of renal stone whenever that diagnosis was not impregnable, and it is interesting to recall the number of times that a positive diagnosis proved erroneous, and no stone was found.

To show the difficulties I meet with in diagnosis I recall a case in which the physicians, including one of the most distinguished diagnosticians in Boston, agreed upon a diagnosis of renal stone. The chief symptom was abdominal pain, but the general condition forbade operation. Besides pain there were other disturbing symptoms which seemed to me dependent upon the stone, because I had seen them time and again in renal stone. The man died (P. G., of Cambridge; lxii, 94), and he had, in fact, a renal stone, but he had also a perforation of the stomach.

I have seen, at least three times, calcified mesenteric tumors in the right side of the abdomen which I think would have suggested the diagnosis of renal or ureteral stone. I have seen pain continuing after the removal of stone from the kidney—a fact that always suggests an overlooked stone, as similar pain in gall-bladder surgery suggests an overlooked stone. This pain has always subsided finally, and is probably owing to some obscure postoperative renal condition. I have seen stone in the kidney fatal twenty-two years after the removal of stone in the bladder, and during these twenty-two years there was never any pain (F. K., vol. xxii, p. 112). I dare say that in renal stones, as in gallstones, there is sometimes no pain, and that these stones are never, therefore, even suspected.

At one time I removed renal stones whenever possible by cutting through the pelvis of the kidney without going through the kidney substance. I found the method safe and efficacious; there was no hemorrhage. I closed the pelvis by suture, without drainage, except to the line of suture.

Then for a number of years I cut down upon the stone through the kidney tissues, always with a well-founded fear of hemorrhage. In some cases the loss of blood was great, controlled only by extensive gauze packing. In opening the pelvis directly—a very feasible operation when the kidney can be brought easily into the wound—the surgeon will require little if any drainage. I use only a small wick to the suture line.

In many cases of stone in the kidney today I find it very easy to deliver the kidney so that I can cut directly into the pelvis, either from behind or at the lower portion. If the stone is a single one and the pelvis is clean, I close directly the wound by sutures of fine silk. If necessary I can drain the pelvis directly, allowing it to heal as the urethra heals after perineal section. Under such circumstances I leave a wick down to the opening in the pelvis.

When it is impossible, as in some cases, to deliver the kidney enough to give a clear view and a clean dissection, I still cut through the renal parenchyma. In my last case I made a transverse incision instead of a longitudinal one. The hemorrhage, as in all cases in which I go through unthinned, vascular renal tissue, was excessive. As I say, however, all my cases of renal stone, by whatever method I have operated, have been successful. I make this statement, however, with the reservation that I have not looked up my cases of renal stone, of which I have a large number, but I do not at this moment recall a fatality in any case in which I have cut deliberately down through comparatively normal kidney upon a renal stone.

I find the kidney a prolific field for interesting and effective surgery —a field in which the immediate results are almost invariably good—

and in which the remote are free from the complications and disadvantages of many abdominal operations. In the subsequent history there is less to annoy both patient and surgeon than in any other form of abdominal surgery.

Dr. Willy Meyer, of New York.

It is of great importance, in the diagnosis of cases of renal and ureteral calculus, that an *x*-ray picture should be taken early.

After having exhausted the means at our disposal with reference to history, physical examination, and laboratory research, the next step should be the *x*-ray picture. After that has been studied carefully we should resort to cystoscopy and catheterization.

In the diagnosis of ureteral calculus the indigo-carmine test is of value when obstruction is caused by the stone, in which case not a bit of colored urine descends, whereas the other ureteral mouth emits gushes of deeply black-stained fluid. In the female the wax catheter is used to advantage.

The functional diagnosis, by means of phloridzin and indigo carmine, is unreliable. In a recent paper by Edwin Beer, of New York, it has been shown that in case of unilateral renal affection the functional activity of the opposite kidney is often greatly impaired. This changes after operation on the diseased kidney.

In operating I have found clamping of the pedicle useful, if we cover the branches of it with thick rubber tubing. Of course, the ureter must be left out of the grasp. To insure proper drainage, in patients suffering from ureteral plus renal calculus, the operation should be first on the ureter and then on the kidney. I am very much in favor of pelviotomy, with following interrupted suturing, in proper cases.

It is advisable to do cystoscopy shortly before ureterotomy for stone, or take another radiograph, as a smooth calculus may have slipped into the bladder. In a case in which I could not palpate the calculus after thorough exposure of the ureter, lately, I opened the canal below the pelvic brim and injected sterilized boric acid solution with a hand syringe through a small soft rubber catheter, which had been introduced into the ureter with its tip cut across, toward the bladder. On removing the syringe a gush of water returned. This was absolute proof of obstruction. Having the *x*-ray picture, I was positive of the presence of stone. I now continued the search and found a perfectly round, small calculi at the very entrance of the ureter into the bladder. Its rough surface was tightly wedged into the swollen mucosa.

I was much interested in the statement concerning the renal tuberculosis cured by out-of-door life. Only those rich in this world's goods, however, can have this advantage. It is a matter of importance to get

these cases early. In the ordinary case of primary tuberculosis of one kidney it is still advisable to have the infected organ excised.

DR. GEORGE W. CRILE, of Cleveland.

My associate, Dr. W. E. Lower, and I have had 46 operative cases of stone in the kidney and ureter. Of these, 2 died following operation. Dr. Lower has devised an instrument patterned after a curved hysterectomy clamp, made adjustable, as the clamp, for closing the carotid artery. By means of this instrument a hemorrhage may be completely controlled. In 2 cases I observed serious postoperative hemorrhage from the tenth to the fourteenth day. Both were treated by direct transfusion of blood and immediate nephrectomy. Both recovered.

DR. J. M. T. FINNEY, of Baltimore.

I agree with what Dr. Richardson has said. The question of diagnosis is most important, and if we place our reliance upon any one method we will make mistakes. I recall a case in which the symptoms much resembled those of stone in the kidney. A shadow was shown in the right iliac fossa which looked like an intestinal concretion. Purgatives were given, but the shadow remained. Catharsis was repeated, and still the shadow remained. The question of misplaced kidney, malignant disease, and other conditions was considered. The patient had been referred to see if there was cancer of the cecum. I was unable to make a diagnosis as to the possibility of displaced kidney, and operated and found the kidney with concretion down in the right iliac fossa. I have operated for stone when I expected to find it and failed to find it. I have operated for something else and found stone when I did not expect to find it. The question of diagnosis, as Dr. Richardson has said, is the most important of all, and we ought to study our cases more carefully. Every unnecessary surgical operation is a reproach to surgery. If we were more careful in our endeavors to make absolute and accurate diagnoses, we would many times find it unnecessary to operate. To repeat a remark which a former Fellow of this Association used to make when I was a student of his, "Nine men out of ten know *what* to do, but the tenth man knows what *not* to do."

DR. M. L. HARRIS, of Chicago.

In connection with the possible errors that may arise in making diagnoses, I recall that a few years ago, before attention had been called to the shadows in the pelvis, I operated upon 2 cases, each presenting distinct symptoms referable to the urinary organs, and each showing a very clear, well-defined shadow in the line of the ureter. In neither case was a stone found. I subsequently had to remove the kidney in one case.

The point made by Dr. Brewer that ureteral stones are usually oblong and cast an oblong shadow is correct in the main, but not absolutely so. A ureteral stone, to become oblong, must have remained in the ureter for some time. A stone that has been in the ureter but a short time may still cast a round shadow as well as an oblong stone if seen on end. I published a paper two years ago, the plates in illustration of which showed one perfectly round shadow from a ureteral stone, and another perfectly round shadow which was not a stone. From the plates alone it was impossible to tell which was the stone case and which was not.

Regarding the error made by the use of the segregator referred to by Dr. Jacobson, the same error may be made with the cystoscope. The same error has occurred when the ureters have been catheterized, by reason of two ureters entering the bladder, though they united above and went to a single kidney. This shows that we must not depend for diagnosis upon a single method, but be guided by all the data that can be brought together.

It is usually supposed that bilateral tuberculosis of the kidneys is a contra-indication to operation. For a long time I believed this. We know, however, that tuberculosis of the kidney, in the large majority of cases, is primarily unilateral. Later both kidneys may become involved. When it is unilateral, of course, removal of the kidney is the proper thing. When it becomes bilateral it may still be operated upon. I have usually declined to operate when it is bilateral. Seven years ago I had a case showing bilateral infection, but one side was more involved and presented a tumor in the abdomen. The patient requested operation and I declined twice, but finally removed the more seriously affected kidney, and the woman got well and has remained so. Since then I have operated on two other bilateral cases. In both cases I selected the more involved side, and both cases are greatly improved.

Dr. Francis J. Shepherd, of Montreal, Canada.

I do not agree that hemorrhage is a simple thing. Within the last year I have encountered most severe hemorrhage in two cases. I was obliged to remove the kidney in each case, and the condition of the kidney as examined afterward convinced me that the right thing had been done.

Regarding the two ureters going to the bladder from the single kidney, I think such a case is very rare. It is comparatively common to have a horseshoe kidney, and here the fused kidneys have two ureters.

Dr. John C. Oliver, of Cincinnati.

Dr. Barrow's paper and specimen represent a very common experience in our part of the country; whenever we do anything in Ohio they always "go us one better" in Kentucky. I had supposed that the stone I here-

with present was the largest that had been removed from the kidney in our vicinity, but I am not at all surprised to find a larger one coming from Kentucky. The only unusual point, in reference to my specimen, is that it is composed of oxalate of calcium.

DR. LEWIS L. MCARTHUR, of Chicago.

It is an evidence to the foresight of Dr. Senn that, when the first exhibition of the *x*-rays was made in Chicago, and he was called upon to express his opinion of it, he said: "I see the advent of this wonder with chagrin and anxiety, lest the student, finding a short route to diagnosis, will rely entirely upon this means and forget, or neglect, the means which already are at hand."

What shall we do, however, when, having made a diagnosis of stone in the ureter or kidney, and having sent the patient to the *x*-ray expert (not to see if stone is there, but to see how many are there, and whether it is necessary to cut down upon the ureter), the *x*-ray expert sends back a plate perfect in detail, yet showing no stone? In such a case segregation of the urine showed no atypical condition of stone in the kidney with pyelitis. Hampered by the *x*-ray picture, I waited six months, and let the patient suffer with numerous attacks. Then, driven to desperation, I operated and found twenty stones in one kidney. I imagined that I could interpret an *x*-ray plate. Later, the *x*-ray man, being told that those plates were worthless, examined them again and said there was really a shadow there. I think I can see one now myself.

Regarding the minute quantity of blood in the urine, mentioned by Dr. Nancrède, which will suggest renal stone and the pain attendant upon appendicitis, which will make one think of a renal colic, I may say that upon six different occasions I have found this to be true. Sometimes the urine actually was pink, in the objective sense as well as under the microscope.

THE DIAGNOSIS AND PROGNOSIS OF TUBERCULOUS AND SEPTIC CONDITIONS OF THE KIDNEY.

By GEORGE E. ARMSTRONG, M.D.,
MONTREAL, CANADA.

Comparatively recent and more exact methods of determining the organic changes in and functional values of the kidneys, together with the experimental researches of Hanau, Baumgarten and his pupils, Hansen and Guiani, as well as those of Wildbolz, have added materially to our knowledge of the diseases of these organs and to our therapeutic resources. The kidneys are, in the majority of cases, the first of the urinary organs to be infected by the tubercle bacillus. That one kidney alone may be affected at first, the other remaining free for a considerable time, is a fact established by a large number of observations. It is with these cases of unilateral renal tuberculosis that we, as surgeons, are chiefly concerned, and this class includes, according to Garrè and Erhardt, about 10 per cent. of the tuberculous diseases.

Between June, 1905, and February, 1908, I removed 11 kidneys; 8 of these were tuberculous and 3 were cases of non-tuberculous pyonephrosis.

Five of the patients were females and 6 were males. Of the 8 tuberculous cases, 5 were males and 3 were females.

The age in the tuberculous cases was from twenty-one to forty-one years; the other 3 cases were aged respectively forty-eight, forty-nine, and fifty-five years.

The first symptoms in 3 of the 5 males were vesical tenesmus, frequency of micturition, and hematuria; in one, frequency with pain but without blood, and in one, a sudden stoppage of the stream, followed by frequency. In the three women the first symptom in

all of them was pain in the loin. Loss of weight was never a conspicuous symptom, although one patient had lost thirty pounds. Cystitis was present at the first examination in 6 cases; in 2 it was confined almost exclusively to the half of the bladder on the diseased side. In 4 cases there were present at the first examination a distinct ulcer around the ureteral opening in the bladder on the diseased side. In one case the ureteral opening in the bladder was swollen, edematous, but not ulcerated. Tuberculous epididymitis was present in two cases. The relative dates of the development of the disease in the kidney, bladder, and testicle could not be determined.

The diagnosis was made in each instance by examining the individual separate urines from each kidney, and finding tubercle bacilli in the urine from the diseased side. This examination was also made to demonstrate the presence of a second kidney and the functional value of each kidney separately. The findings in 4 of these cases have been published in the *Montreal Medical Journal*, and are referred to by Dr. R. P. Campbell, in his paper published in the *Annals of Surgery*. The details of the remaining 4 cases are as follows:

A. B., aged twenty-nine years. English cotton mill operative. Married. Was admitted to the Montreal General Hospital for pain in the right loin of six or seven weeks' duration. Slight at first and of a dull aching character, it gradually became worse and compelled her to give up work. She had lost in weight. Her nutrition was poor; mucous membranes pale. In the right loin was a mass which could be easily palpated, and which was, apparently, an enlarged prolapsed kidney somewhat tender on pressure. Amount of urine excreted in twenty-four hours, thirty-two and one-half ounces. It was found impossible to catheterize the right ureter. The urine from the left kidney was drawn by a ureteral catheter, and that from the right was obtained from the bladder. From the right kidney came only pure pus, in which no tubercle bacilli could be found. Around the orifice of the right ureter was an ulcer. The urine from the left kidney was as follows:

	Left.	Right.
Specific gravity	1015	
Reaction	Acid.	Only pus in which no t. b. c. were found.
Urea	8 grains to ounce.	
Albumin	Trace.	
	Sugar present after phloridzin.	
	No t. b. c.	

The right kidney and ureter were removed, and she made an uninterrupted recovery. A year afterward she was confined in the Montreal Maternity Hospital, when an examination of the bladder was made and the ulcer was found completely healed. The woman seemed in perfect health. The removed kidney was large, with scarcely any renal tissue left. It was composed of large pockets filled with pus. The Pathologist's report was "Tuberculous Pyonephrosis."

CASE VI.—W. J. K., aged forty-one years. Complained of frequency of micturition. Had had appendicitis eighteen months before, and the appendix was removed. His first symptom was in the fall of 1906, when a sudden stoppage of the stream was noticed, but it soon started again. Pain sometimes felt in the penis and the bladder, with increased frequency day and night. Has never noticed blood in the urine, which, however, has gradually become muddy and thick. During the summer of 1907 felt a pain in his loins. Has lost in weight. No history of fever or night sweats. Cystoscopic examination shows acute cystitis over the left side of the bladder with mucopus and doubtful looking tubercles, more especially about the left ureteral orifice, which is very red, wide open, and irregular in shape, slight ulceration, position normal. The right orifice is normal and right side of the bladder is almost quite healthy in appearance. The bladder holds six ounces with difficulty. Neck of the bladder bleeds quite easily. Ureters were catheterized and the urine gave the following result:

	Right.	Left.
Reaction	Acid.	Alkaline.
Color	Clear, yellow	Pale, watery.
Specific gravity	1026	1006
Urea	2.9 per cent.	0.6 per cent.
	Blood cells (traumatic).	Numerous tubercle bacilli.
	No pus.	Pus in quantity.

The kidney was removed on January 31, 1908. Adhesions were considerable. The kidney was enlarged, rough in appearance, and the capsule adherent.

CASE VII.—Mrs. J. S. C., aged thirty-three years. Married. II-para. Pulmonary tuberculosis diagnosticated in March, 1905. Pain in the left kidney about the same time. Never had any hematuria. Pus in the urine was first discovered in April, 1906. The examination of the urine gave the following:

	Common.	Right.	Left.
		15 c.c.	5 c.c.
Color	Turbid.	Slightly cloudy.	Bloody.
Reaction	Acid.	Acid.	Alkaline.
Specific gravity		1018	
Urea		2 per cent.	No urea.
Albumin	Alb.	Trace.	Alb.
Pus	Pus.	Few.	Almost pure pus.
T. b. c.	T. b. c.	No t. b. c.	T. b. c. present.
Staphylococci		Staphylococci.	

On palpation the left kidney was found to be enlarged to nearly the size of a child's head and tender on pressure. The pulmonary lesion is reported to be perfectly healed. The discomfort in the left side is considerable, and the bladder irritation extreme. Micturition sometimes as often as every twenty minutes, and as often as twenty times in the night, accompanied by pain and occasionally a speck of blood.

I removed the kidney, and the patient made a very smooth and uninterrupted recovery. In four weeks the pain associated with micturition had entirely disappeared, and the intervals had increased to three, four, and sometimes five hours, and on one occasion six and one-half hours.

CASE VIII.—M. W., female, aged thirty years. Early symptoms simulated nephrolithiasis. An examination of the urines at this time, September 17, 1907, gave the following:

	Right. 10 c.c.	Left. 10 c.c.
Specific gravity	1012	1022
Reaction	Acid.	Acid.
Color	Straw.	Blood.
Urea	1.8 per cent.	2.6 per cent.
	Alb.	Alb. trace.
	12 m. nec. to red. 1 c.c. of Fehling.	3 m. nec. to red. 1 c.c. of Fehling.
	Δ −0.61	Δ −1.46
	Pus in quantity.	R. b. c. traumatic.
	No t. b. c.	No pus.
	Large and small bacilli.	

A diagnosis of stone was made, and one of my colleagues did a nephrotomy. The pelvis and calices were dilated and a cavity was present in the upper pole, but no stone was found. A sinus persisted, and small perinephritic abscesses formed and were opened from time to time. The case seemed clinically to resemble very closely the condition described by Brewer as "acute unilateral hematogenous infection of the kidney." On November 28, 1907, the urines were as follows:

	Right.	Left.
Specific gravity	1012	1022
Reaction	Acid.	Acid.
Urea	0.6 per cent.	2 per cent.
	Pus.	None. A few red blood cells (traumatic).
	Δ −0.75	Δ −1.14

I removed the kidney on December 6, 1907, and the pathological report was that it was tuberculous, the pyogenic infection being secondary.

The chemical reaction was in each instance alkaline. The urine from the diseased kidneys was never acid; in 3 the urine was

alkaline and in 2 neutral. In 3 cases, only pus was obtained. As acid reaction is a characteristic of tuberculous pyuria, and a neutral and alkaline reaction an evidence of mixed infection, it follows that in every case there was a mixed infection at the time of examination. A disagreeable odor was generally present in those that gave an alkaline reaction.

After establishing a diagnosis of tubercle in one kidney, it becomes necessary to estimate, if possible, the extent of the disease, the functional value of the kidney, and also to demonstrate the presence of a second kidney and its functional value. In the very earliest stage it is often difficult to find tubercle bacilli. They may be few in number. In the late stages, when the kidney is little more than a pus sac, they seem to have died out and to be difficult to find in the pus coming from the kidney.

These results correspond closely with those of Ekehorn, who found bacteria relatively few in number in old cases in which the kidney after extirpation was found to be little more than a pus sac with sclerotic walls and thin pus. The urine in such cases is very purulent and the bacteria few in number. He reports a case of a woman, aged thirty years, who came into the hospital in 1902, with a diagnosis of tuberculosis of the left kidney. Numbers of tubercle bacilli were present in the urine; the disease was relatively recent. She was a strong, able woman, and would not submit to an operation while she was free from pain. She left the hospital improved, and having gained three kilos in weight. In 1904 she was re-admitted to the hospital. During this period of two years she had worked hard and felt well. Her only complaint was of frequent micturition. The tubercle bacilli in the urine were few in number and the pus greatly increased in quantity. The extirpated kidney was found to be in a condition of fully developed tuberculous pyonephrosis with thin fibrous walls.

Another of his cases was that of a young woman, aged twenty-two years, with tuberculosis of the right kidney. In June, 1906, after lifting a heavy load, she suffered for a few days afterward from a painful feeling in the right lumbar region. She felt the pain only when she bent forward or straightened up. It was not sufficient to

prevent her from continuing with her usual work, and in a few days she felt quite well. On October 5, 1906, blood appeared in the urine, and at the same time right renal colic, generally two attacks a day, each one lasting fifteen or twenty minutes. This sometimes continued for a week, when she seemed to recover perfectly and could do her work as usual. On November 16 blood reappeared in the urine, but without pain. There were no bladder symptoms. In the urine was found pus cells and numerous tubercle bacilli, with only a trace of albumin. The number of tubercle bacilli in this case was great, while the number of pus cells was small, with here and there a red blood cell. Only 6 c.c. of urine came from the right ureter during an hour. The urine was not pale, but had a normal color. That from the left kidney was quite normal. The kidney was removed on November 23, 1906, and the extirpated kidney showed comparatively small changes. When the kidney was split it appeared for the most part sound. The chief changes from the normal were found in the three papillæ.

Ekehorn draws the following conclusions: Numerous bacilli may be found in the urine in very early cases, and the number of bacteria found at different times varies during the different periods of the disease. When a new part becomes involved, the bacteria are more numerous. With numerous bacilli there may be a small quantity of pus, and with a large amount of pus the bacteria may be relatively few in number. When the pus is in large quantity and the bacteria few, the lesion is probably an old one, with cavities and sclerotic walls. If the pus in the urine is insignificant, then it is probable that no very large part of the kidney is involved, although many bacilli may be present.

The functional value of the diseased kidney is difficult to determine with certainty. A small amount of disease may materially lower its efficiency. This is very well shown in one of my cases where the kidney involved excreted urine turbid in color and neutral in reaction; specific gravity, 1007; urea, 1.1 per cent., and only a trace of albumin; sugar present, and a freezing point of 0.35°; pus and tubercle bacilli. When the kidney was removed nothing was evident on or beneath the capsule, nor, indeed, was it at first

apparent after longitudinal section had been made from pole to pole. On a more minute inspection one calix was found where all the points of the pyramids projecting into it showed macro- and microscopically typical tubercle formation. Hematuria had been a prominent symptom in this case. The kidney was removed because the hemorrhages were so large and recurred so frequently that he was becoming decidedly anemic.

To establish the diagnosis pus must be found as well as tubercle bacilli, as in patients suffering from pulmonary tuberculosis the urine may contain tubercle bacilli and yet at autopsy no alteration in the kidneys be found. This has been noted by Jani and Schuschardt and others.

The determination of the functional value of the other kidney is of great importance, and the results in my cases, based upon an examination of the urine from this kidney, have been found to truly indicate its efficiency. Liek, however, reports a case where such was not the case. The urines from the two kidneys in Liek's case were as follows:

Right.	Left.
15 c.c.	50 c.c.
Clear.	At first turbid, later clear.
Mildly acid.	Alkaline.
No sediment.	Very rich in leukocytes.
No albumin.	Trace of albumin.
After 0.01 phloridzin, after twenty minutes, good reaction.	After twenty-two minutes sugar reaction.
Freezing point not taken.	Freezing point, —0.6°

From these findings it was concluded that the right kidney was sound.

An operation was undertaken to remove the left kidney, but the infiltration of the musculature was extreme, extended down to the true pelvis, and the kidney could not be made out. While searching for the left kidney the condition of the patient became so bad that the operation was abandoned and the wound tamponed. The patient died a few days later. At the autopsy, this right kidney, which had, seemingly, good functional capacity, was found very

much enlarged, three or four times its normal size. After longitudinal section was made, the pelvis and calices were found very much dilated, the kidney parenchyma pale, yellow, and containing many miliary abscesses. Microscopically it showed extreme changes about the parenchyma and interstitial tissue, cloudy swelling and necrosis of the epithelium, small-celled infiltration and miliary abscesses. As Liek remarks, the case would seem to indicate that these methods of determining the functional value of a kidney are only of relative value.

In a man, aged twenty-one years, suffering from rupture of the urethra and severe pyelonephritis of the left kidney, the right kidney gave a clear urine in sufficient quantity in typical intervals without sediment and without albumin. After the injection of 0.01 of phloridzin, good sugar reaction appeared in twenty minutes. The electric test seemed normal. From this examination the removal of the left kidney was considered. At the autopsy this, apparently, sound right kidney was found in a condition of extreme congenital deficiency and not sufficient to maintain the blood of proper density.

Descending renal tuberculosis would seem to be three times as common in women as in men. In 464 cases of Albarran, Facklam, König, Czerny-Simon, and Vigneron there were 127 males and 337 females. The ascending form is confined almost exclusively to men.

The two sides are affected with almost equal frequency, although Küster, after examining a large number of cases, thinks there is perhaps a little preponderance of involvement of the right side, and suggests the association of this condition with floating kidney.

There can be little doubt that renal tuberculosis is seldom, if ever, really primary. If it is true that 90 or 95 per cent. of all adults have, or have had, tuberculous lesions, it would certainly seem that the kidney involvement must be, as a rule, secondary to some glandular, pulmonary, or other tuberculous lesion. Vigneron and Israel found secondary tuberculosis in 50 per cent. of so-called primary renal tuberculosis. The kidney lesion may, however, be primary clinically *i. e.*, it may be the primary

lesion in the urinary tract and the only lesion active at the time, yet a careful study of autopsies renders it doubtful whether it is not in reality always secondary.

The bacilli are generally carried in the blood stream, although the kidney may be infected by extension from adjacent tissues, particularly the peritoneum, and one cannot deny that possibly the infection may, in some instances, ascend from the bladder to the kidney. The preponderance of descending or hematogenous infection is well established by the studies of Steinthal and Simmonds autopsy reports. Clinically, the renal may be of a truly primary focus. Of the primary lesion there may be no evidence as to its situation or even of its existence. Baumgarten's experiments indicate that tubercle bacilli never go against the stream, either in the blood or in the lymph vessels. He injected a highly virulent pure culture into the urethra of rabbits, and attempted in that way to produce a tuberculous ulceration of the bladder and prostate, but he never got the infection to spread up to the kidneys or the epididymis. To produce an ascending infection of the kidneys, it was necessary, after injecting the ureter with the culture of tubercle bacillus, to put a ligature around distal to the injection, in that way arresting the flow of urine. There was the same difficulty in producing infection of the epididymis from the bladder. Albarran, Bernard, and Salomon had the same experience, failing to cause changes in the kidney by injecting tubercle bacilli into the ureter until retention of the ureter was artificially produced by ligature. To produce infection of the testicle, the testicle itself must be injected, and then infection may pass along the duct to the prostate. On the other hand, Wildbolz seems to have succeeded in infecting the kidney from injection into the ureter without ligature.

Clinically, the other kidney may become tuberculous after the first one. In these cases there is sometimes present a tuberculous cystitis, with perhaps a tuberculous ulcer around the ureteral opening of the first side affected. In these cases Tuffier thinks that the infection of the second kidney is an ascending one. This view seems to have some support from the recent experiments of Wildbolz, but it is not supported by Albarran, Bernard, and Salomon, whose

experiments would indicate that the second kidney, like the first, is a descending hematogenous infection.

There is little doubt that the cystitis is secondary to the renal infection in the great majority of cases. Just how long before the bladder becomes involved I have not been able to determine. Ulceration in the bladder seems to begin just at the entrance of the ureter through the bladder wall, where there is a moderate narrowing, as if the bacilli were detained at this narrow point and there get in their work. These ulcers are sometimes distinctly crater like.

In one of my cases the bladder was examined three years after the onset of symptoms. Cystitis and ulcer were then present. There had never, in this case, been any pain or frequency. In the second case, although cystitis and ulcer were present, there were no symptoms. In the third case symptoms of frequency and pain had been present for six months, and in the fourth for eight months, and in these cases the bladder symptoms had been among the first and most prominent throughout the illness. In the fifth and sixth cases there was no cystitis and no ulcer; in the seventh and eighth the cystitis was confined almost entirely to the lateral half of the bladder on the diseased side, and in one of them, No. 7, there was also present an ulcer around the ureteral orifice of that side. In both Nos. 7 and 8 the opposite half of the bladder and opposite ureteral opening were normal.

I do not think that in the cases in which the bladder symptoms were primary the kidney lesion had been an ascending one. In two of them the kidney, when removed, was very extensively diseased, being little more than a pus sac. The bladder symptoms rapidly improved immediately after the nephrectomy, and in the third, although the kidney lesion was small, the bladder immediately recovered, and has remained well ever since.

It would seem that renal tuberculosis may remain comparatively latent for a long time, giving rise to few symptoms perhaps for years. In the 8 cases upon which I have operated the disease in the kidney was obviously much older than that in the bladder.

Five of my patients were males and 2 of them had an associated tuberculosis of the epididymis. In both of these cases there was

also present cystitis with ulcer around the ureteral orifice. The time of incidence of these two conditions is not known, because we have no knowledge of the time when the cystitis and ulcer appeared. It is altogether likely that in these cases the testicular infection is also hematogenous.

In four of Israel's cases, there was besides the renal tuberculosis, a tuberculous epididymitis without any disease of the bladder.

The combination of tuberculosis of the urinary and genital organs in women is a rare occurrence.

Küster thinks an ascending kidney tuberculosis is only possible by spreading from the mucous membrane or through antiperistaltic contraction of the ureters. This retroperistalsis has been observed, but it can only take place when there is a stricture in the lower end of the ureter analogous to the ligature applied by Albarran.

I have been unable to discover any predisposing cause in my cases. None of them had suffered from trauma; none of them admitted having had specific urethritis; in none of them was the condition obviously associated with floating kidney, and none of the kidneys removed showed any congenital lobulation or anatomical abnormality.

In five of these cases, the kidney, when removed, showed very extensive caseation, breaking down of tissue in the centre and at both poles. In one the kidney was very hard and contracted; in one there was nothing outside of the kidney, and but one calix where all the surrounding tissue was tuberculous, the disease spreading in the surrounding tissue to the depth of three-sixteenths to one-quarter of an inch, the whole disease occupying about 9 c.c. of kidney tissue. In this case hemorrhage was a prominent symptom.

Zondek and Israel give an anatomical reason for the frequent involvement of the lower pole of the kidney, namely, the occasional existence of an artery springing direct from the aorta and going to the lower pole of the kidney, so that the infection becomes localized.

In advanced cases I have found the fatty capsule altered and very much adherent to the capsule of the kidney, and in one it was, indeed, very difficult to separate it from the kidney.

Marked involvement of the ureter was present in two cases. The

etiology of the changes in the ureter may vary in different cases, but the explanation given by Aschoff seems to harmonize very well with the clinical findings. Aschoff thinks that the involvement of the walls of the ureter is an ascending lesion, secondary to the ulcer in the bladder, the infection spreading upward through the lymphatics from the ulcer at the ureteral opening in the bladder, the ulcer itself being a descending lesion.

Some cases have been reported in which the infection seems to have spread along the mucous membrane of the ureter by direct continuity from the pelvis of the kidney. In two of my cases all the coats of the ureter were involved. In one it was thickened and shortened, raising the cornu of the bladder and rendering catheterization of the ureter difficult; in the other the walls were soft and friable; the ureter felt unusually large and edematous.

Cases are reported in which ulceration of the mucous membrane of the ureter has been followed by cicatricial narrowing and even total obliteration.

The question of the frequency of involvement of the second kidney is of great interest. The following figures put together by Vigneron throw considerable light on this question: In 322 autopsies the disease was unilateral in 132, or 41 per cent.; in 326 operated cases the disease was one-sided in 198, or 60 per cent. These figures speak in a general way of the accuracy of the findings during clinical examination and the operating table. By the time these people come to autopsy, it would naturally be expected that both sides would be involved in a much larger proportion of cases.

In another case many of the symptoms of tuberculous disease of the right kidney were present, namely, pain in the right loin and along the course of the right ureter; pain and frequency of micturition and pyuria; the patient gave a typical reaction to tuberculin, and no sign of any other focus could be discovered. Nevertheless, no tubercle could be found in the urine. She improved under rest and dieting, and I did not recommend operation.

The temperature varies in these cases, and is generally elevated when ulceration of the bladder is present, but, as remarked by Garré and Erhardt, it disappears almost at once after the kidney

has been removed, although cystitis and the ulcer remain. They conclude that the only view to take of this is that the temperature was due to absorption of infected urine by the ulcerated surface.

There is nothing characteristic about the enlargement of the kidney in tuberculous disease. The enlargement is moderate in ordinary cases when due to caseation and excavation in the poles of the kidney. When a pyonephrosis develops, the enlargement may be considerably greater. When one kidney is diseased and does its work imperfectly, the other may undergo a compensating hypertrophy, and the enlargement from this compensating hypertrophy has been mistaken for enlargement due to the disease, and the wrong kidney removed. If ureteral catheter specimens are examined, this error can be easily eliminated.

The examination of the bladder is of interest, and shows that the disease is first located at the ureteral opening on the diseased side, and later in the trigonum.

In the diagnosis Garré and Erhardt recommended palpation of the ureters through the rectum or vagina. Here one feels a distinctly thickened ureter on the diseased side as a tender cord. If all other methods of diagnosis fail, there remain exploratory incision and the treatment of whatever condition may be found. The early symptoms, and, indeed, sometimes the later as well, suggest stone in the kidney. Colic may be present in both conditions, but pyuria is an early symptom in tuberculous disease and a late symptom in nephrolithiasis, and later the pain and frequency in micturition is not such a prominent feature in nephrolithiasis as in tuberculosis. The duration of tuberculosis of the kidney may extend over a long period, ten or fifteen years, according to Czerny-Simons.

The prognosis in renal tuberculosis is very bad when not relieved by operative measures. It would be interesting to learn the results of climatic and tuberculin treatment in a series of cases of early renal tuberculosis. With the knowledge at present available, it would seem that nephrectomy is the safer and more conservative plan. As to partial nephrectomy, a careful examination of the kidneys removed has seemed to demonstrate that such an attempt

must necessarily prove uncertain and unsatisfactory. The difficulty of locating the disease and removing it altogether, even after complete longitudinal splitting of the kidney, seems to us to be unsurmountable, and the literature contains many cases of this so-called conservative surgery of the kidney which have resulted in permanent fistulæ and subsequent nephrectomy. Bilateral disease, colic, hemorrhage, retention, or localized abscess are the conditions which Czerny and Israel consider to call for nephrotomy. These conditions demand a palliative operation. When one kidney is in a condition of pyonephrosis, but still secreting a urine of specific gravity of 1007 and 1008, while the other kidney secretes urine of the specific gravity of 1010 or 1012, it is impossible to sacrifice any secreting tissue without imperiling the proper consistency of the blood. In such cases nephrotomy is justifiable. One must, in undertaking nephrotomy under these circumstances, be prepared to put up with the annoyance of a persistent sinus through which more or less purulent urine may pass.

In general, nephrectomy is the operation of choice if the disease is limited to one kidney, and is advisable not only to relieve the patient from that focus of disease, but to relieve the good kidney from the extra work entailed by the diseased kidney. The contraindications against nephrectomy are absence or imperfect functional power of the opposite kidney, evidence of incipient disease of the other kidney, as indicated by the presence of albumin, a few pus cells with tubercle or other bacilli. Cases are reported in which after the diseased kidney has been removed the other has improved, the albumin and pus cells in some cases disappearing altogether.

The kidneys have been removed in each instance with their capsule. In none of them was there any special difficulty; in none of them were there any adhesions to the vena cava; the peritoneum was adherent in one.

The ureter has, in each instance, been removed to the level of the brim of the pelvis or a little lower. I have adopted the plan suggested by Mayo and injected the distal end of the ureter with twenty minims of pure carbolic acid and then tied it. The recovery from operation has, in each instance, been satisfactory. There has been

no operation mortality. The quantity of urine secreted is disturbed wonderfully little. The secretion during the twenty-four hours succeeding any operation is, as a rule, less than usual. In my cases the quantity increased day by day until the normal was attained. Hypertrophy of the remaining kidney has been noticed in some cases.

The subsequent history of these cases has been dependent very largely upon whether ulceration of the bladder was present or not at the time of operation. In my first case the patient recovered perfectly at the time, left the hospital well, and I learned that he died some months afterward of acute miliary tuberculosis. The second case a year after operation was still suffering from frequency of micturition, being compelled to get up four, five, and six times at night. Cystoscopic examination at this time showed that the ulcer present at the time of operation was still present, possibly not so deep, or quite so large, but not markedly changed. During the year his general health had improved, and he weighed more than ever before, but the washings were too painful to be carried out regularly. He was put upon tuberculin and given an injection every ten days. Since then he has steadily improved. No examination has been made of the bladder since, but in my last letter from him, dated March 21, 1908, he was passing an average of 50 to 55 ounces a day. He can now go three hours at a time with ease, and sometimes four hours, and is only up twice at night. This is the condition fifteen months after the removal of the kidney. In another case where an ulcer was present the pain has all disappeared and the frequency of micturition is very much diminished. In still another, two months after operation the pain and distress in urination and the frequency are not much less than they were before the kidney was removed. In this case, like the other, the passage of an instrument was so painful that the man refused to have it done. He is, at present, taking guaiacol, and if an improvement does not follow, I shall put him on tuberculin. These results are in marked contrast with the rapid and complete disappearance of pain and frequency after the removal of a non-tuberculous pyonephrosis. In one such case all bladder symptoms had passed away completely five weeks after the kidney was removed.

The continuance of pain and frequency in these cases with ulcer raise the question if it would not be better to be more radical and to remove the whole of the ureter with the cornu of the bladder. This procedure, of course, adds considerably to the severity of the operation.

Tuberculosis of the genital organs or bladder may become an urgent reason for nephrectomy rather than a contra-indication, the pain of the bladder and distress generally improving markedly after the kidney is removed. Early bladder disease will almost certainly recover as soon as the kidney is removed, and even extreme cystitis with ulceration around the ureteral opening may recover, particularly if the diseased cornu of the bladder itself is excised, as recommended by Kümmell.

The results obtained in renal tuberculosis are improving. Schmieden collected 201 cases of nephrectomy after renal tuberculosis; of these, 142, or 71 per cent., recovered, and 59, or 29 per cent., died. During the last ten years the mortality has not been more than 24 per cent. Israel reports 29 nephrectomies; of these, 14 were primary, with sound bladders; 11 recovered perfectly. Küster had 11 permanent recoveries in 17 cases of nephrectomy; Schede, 16 in 22 cases, and Czerny, 11 in 27 cases.

In conclusion, I desire to express my appreciation of Dr. R. P. Campbell's kindness and dexterity in catheterizing the ureters in the cases that I have reported.

ACUTE UNILATERAL HEMATOGENOUS INFECTIONS OF THE KIDNEY.

By GEORGE EMERSON BREWER, M.D.,
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In connection with the other papers which have been presented this morning, upon the surgical diseases of the kidney, I desire very briefly to call the attention of the Association to a type of acute renal disease, which is not, as a rule, recognized by the profession. I refer to the early stage of an acute hematogenous infection of the kidney. That I am justified in stating that the condition is not generally recognized is evidenced by the fact that of nine more or less typical examples of the disease which have been admitted to my service at the Roosevelt Hospital during the past four years, only one came in with a diagnosis of renal infection. Of the other 8, 1 was diagnosticated acute cholecystitis, 1 a perforating lesion of the colon, 1 general sepsis, the remaining 5 being sent in with the diagnosis of acute appendicitis.

The condition to which I refer was first brought to my attention by the following case, which occurred in my service at the New York City Hospital some twelve years ago.

The patient was a female, aged twenty years, admitted to the hospital suffering from double femoral fracture and multiple contusions of the body. After some three weeks of treatment, during which there were no evidences of disease or infection of any kind, she suddenly became violently ill, with symptoms suggesting an attack of grip. The temperature rose to 104° F. or more; the pulse was accelerated; she complained of pain in the back and extremities. After two or three days of observation, a careful examination revealed tenderness over the right kidney, albumin and

pus in the urine. Exploratory nephrectomy was advised, and refused by the patient. The symptoms increased in severity; she complained of constant aching pain in the right flank, had a number of chills, became delirious, and presented every evidence of a profound and rapidly progressive sepsis. At no time did she complain of pain or tenderness over the left kidney. Consent was finally obtained for operation. Under general anesthesia the right kidney was exposed by a lumbar incision. The perirenal fat was found to be edematous; the surface of the kidney was studded with deep red, elevated lesions. On incising the cortex, the entire parenchyma was found to be filled with minute abscesses, the largest being about 0.5 cm. in diameter. There was considerable hemorrhage from the cut surface of the kidney, which was controlled with difficulty. As the patient's condition was critical, the kidney incision was packed with gauze and the external wound partly united and dressed. She died within twelve hours.

During the next five years two other cases were encountered, each almost identical in onset, clinical history, and pathological findings. In both of these cases the kidney was explored, incised, and drained. Both died within twenty-four hours.

Up to this time I feared to perform a nephrectomy, for the reason that I believed the lesion to be bilateral, although the symptoms pointed to one side only.

The next case was, as will be seen, more carefully studied, and, the treatment being the same, the autopsy gave me my first definite conception of the true pathological lesion, and clearly pointed to more radical treatment.

The patient was a man, aged twenty-one years, who at first complained of general pain and fever. The symptoms temporarily subsided, but three weeks later pain occurred over the right kidney region, and was accompanied by a rapidly rising temperature and other symptoms of progressive sepsis. On examination, there was tenderness and some muscular rigidity in the right flank. The urine was albuminous, contained some pus, a few red cells, and casts. Urine from the right kidney was scanty, highly albuminous, contained many red cells, and a few white cells; that from the left

practically normal. Temperature, 105.5° F.; leukocytes, 20,200. No evidence of other septic foci could be found.

The right kidney was exposed by lumbar incision, and freely opened by a cortical cut. The entire parenchyma was studded with minute abscesses. Drainage was inserted and the wound partly closed. There was marked improvement in the symptoms, which continued for several days, but this improvement was succeeded by a gradual return of the septic manifestations, with scanty albuminous urine, delirium, and death. On autopsy, the right kidney was found to be completely destroyed by numerous abscesses. The left kidney, spleen, and other organs showed the presence of very recent septic infarcts, which had not broken down. Cultures demonstrated Streptococcus pyogenes. In this case the lesion was evidently unilateral at the time of the first operation, and had the kidney been removed at that time recovery would probably have occurred.

This case served to awaken my interest in the matter, and, taken in connection with my previous experience, conclusively demonstrated that in these cases we have to do with a severe type of infection, presenting an obscure symptomatology, which tends to progress rapidly to a fatal termination unless something far more radical in the way of treatment be employed than that carried out in my earlier cases.

It is a well-known and generally accepted fact that during the progress of any acute infectious disease a certain number of microorganisms find their way into the blood current. It has also been shown by numerous experiments that under certain conditions these organisms are excreted through the kidneys. If the number of organisms is comparatively small, if their virulence is low, and if the kidneys are in a healthy condition, the transit of these organisms through the renal apparatus gives rise to no demonstrable lesion. If, on the other hand, the number of the organisms is large, if their virulence is high, or if one or both kidneys are diseased, lesions are produced, which may vary from a slight cloudy swelling or glomerular nephritis to a complete destruction of the organ by purulent infiltration or necrosis.

The lesions most commonly found in these cases are due to a plugging of the smaller arteries and capillary vessels with groups of organisms, surrounded by an encircling zone of round cell infiltration. Where the larger trunks are thus involved, triangular infarcts are present; where the capillaries only are involved, minute abscesses are seen throughout the cortex and beneath the capsule. If the process is allowed to go on, the bacterial emboli are rarely seen; only areas of necrosis and purulent infiltration are found. At a still later stage many of these collections of pus coalesce, forming larger parenchymatous abscesses, which may rupture through the capsule, giving rise to a perinephritis, or into the pelvis, giving the typical picture of pyelonephritis. In some of the cases the condition has been described as an acute purulent interstitial nephritis. In the writer's opinion all of these appearances are but different stages of the same process.

As Israel had already called attention to the fact that trauma, calculus disease, ureteral obstruction, and floating kidney act as strong predisposing factors in directing a given blood infection to one kidney, a series of animal experiments were undertaken to verify these statements, and to afford an opportunity of studying the lesions thus produced.

Broth cultures of various pathogenic organisms, as the colon bacillus, Bacillus typhosus, Streptococcus pyogenes, Staphylococcus pyogenes aureus, pneumococcus, and others were injected into the ear veins of rabbits and dogs, and one kidney subjected to various forms and degrees of trauma. In other cases conditions simulating calculus were produced by injecting bismuth paste into the pelvis and ureter, while in others the ureter was ligated. In a large proportion of these experiments lesions were produced in the injured kidney identical with those found in our clinical cases. A record of these experiments, together with a report of thirteen clinical cases, was published in *Surgery, Gynecology, and Obstetrics*, in May, 1906, to which the reader is referred for further details. Without dwelling further upon the pathology of these cases the writer will proceed to describe the three clinical types of the infection.

First, the severe type in which the toxemia is so great as to obscure the comparatively mild renal symptoms. This type progresses rapidly to a fatal termination unless promptly arrested by nephrectomy. Thirteen cases of this type have come under the observation of the writer, of which, 5 were treated by nephrotomy and drainage, death following in every instance; 8 were treated by nephrectomy, all recovering.

The following two cases will serve as examples:

A woman, aged twenty-two years, experienced a severe pain in the epigastrium and right side of the abdomen, with vomiting and high fever. She was sent to the Roosevelt Hospital with a diagnosis of acute appendicitis. On examination, the appendix region was free from evidences of inflammation. There was, however, pain and muscular rigidity in the right hypochondriac region, with tender points over the gall-bladder and the costovertebral angle. Temperature, 105° F.; pulse, 120; leukocytes, 18,000.

Cystoscopical examination was negative, urine from the right kidney scanty and slightly albuminous, few pus and blood cells; that from the left kidney was abundant and apparently normal. Widal negative; no plasmodia; no tubercle bacilli in the urine. The diagnosis rested between an acute infection of the gall-bladder or kidney. Small anterior incision; gall-bladder and liver found to be normal, but the right kidney seemed to be enlarged. Anterior incision united, and the kidney exposed by lumbar route. The perinephritic fatty tissue was edematous; the kidney enlarged, highly congested, and the seat of innumerable small infarcts. Nephrectomy performed. After operation, the temperature fell from 105.5° F. to 97° F. within twelve hours, and thereafter remained practically normal. She made a satisfactory convalescence. Microscopic examination of the specimen showed it to be filled with minute embolic abscesses. One year later this patient married and became pregnant. I had an opportunity of examining her urine before and after her confinement. It was normal in every respect. Her confinement was normal, and she presented the picture of robust health two months later.

A young married woman was admitted to the Roosevelt Hospital,

suffering from right-sided abdominal pain, high fever, and extreme nervous restlessness. Six weeks before, she had an attack of supposed peritonitis from unknown cause. After recovery from this she remained well until forty-eight hours before admission to the hospital, when she began to complain of pain in the region of the gall-bladder, with vomiting and a rapidly rising temperature. On admission the temperature was 105.8° F.; pulse, 140; rapid respiration. Examination of the chest was negative. On attempting to palpate the abdomen, the patient complained of such extreme tenderness, and became so excited and hysterical, that nothing could be elicited. (These symptoms were undoubtedly exaggerated by the presence of a co-existing exophthalmic goitre.) The following morning the temperature had fallen to 102° F., but the pulse was extremely rapid and weak. Abdominal palpation revealed tenderness and marked muscular rigidity in the upper right quadrant, tenderness to pressure over McBurney's point and in the costo-vertebral angle. Blood count showed 16,000 leukocytes, and 79 per cent. polynuclears. Urine was abundant, contained a trace of albumin, and a few pus cells.

She was immediately prepared for operation, the diagnosis resting between cholecystitis, subphrenic abscess, or abscess of the liver. An incision through the right rectus muscle revealed no intra-abdominal lesion, save a slight redness and edema of the peritoneum overlying the right kidney. The anterior incision was closed, and the kidney exposed by a lumbar opening. The perirenal fat was edematous, the kidney was highly congested, and its cortex studded with dark red lesions. Nephrectomy, followed by an intravenous infusion of 1500 c.c. of normal salt solution. After removal, the kidney was bisected and found to be the seat of numerous infarcts and miunte abscesses.

Cultures taken from a freshly opened abscess gave a growth resembling the colon bacillus, but on further investigation it was found to be a non-pathogenical organism, probably a contamination. The patient made an uninterrupted recovery, the temperature falling to normal immediately after operation.

It will be observed that in both these cases the symptoms and

signs strongly pointed to an intraperitoneal septic focus, rather than to a lesion of the kidney. In fact, in the second instance I felt so sure of the diagnosis that no cystoscopic examination was made.

The next group of cases may be classed as the intermediary type, for the reason that while the initial symptoms may be as severe, the evidences of grave and progressive toxemia are wanting.

These cases, like the preceding group, often simulate, in their symptomatology, appendicitis, cholecystitis, or abscesses of the liver. If unrecognized and unrelieved by appropriate treatment, they go on to the formation of the more definite and more easily recognized text-book lesions, as renal abscess, perinephritic abscess, pyelonephritis, or pyonephrosis. In not a few instances where the pain is mild in character, or where the mind is clouded by the toxemia, fever is the only symptom which attracts the attention of the medical attendant, and in these cases a diagnosis of typhoid fever is not infrequently made. The lesions in these cases, while the same in general character as in the severe type, are fewer and more scattered, and the amount of renal tissue involved is less. Stripping the capsule from the affected organ when the lesions are small, or combined with the opening and draining of cortical abscesses or areas of necrosis when present, constitutes the best treatment. In certain instances, where the treatment has been delayed too long, the suppurative process continues and a secondary nephrectomy may be necessary.

Six cases of the intermediary type have been operated upon by the writer. All were decapsulated; in two cases, in addition to the decapsulation, several cortical abscesses or areas of softening and necrosis were opened and drained by gauze tape. All made satisfactory recoveries, although in the drained cases the convalescence was slow, and in one the temperature persisted for several weeks.

The following examples are fairly representative of this class:

A female patient, aged thirty-two years, was sent in with a diagnosis of acute appendicitis. The attack began by a severe right-sided abdominal pain, high fever, and prostration. There was marked muscular rigidity over the appendix and gall-bladder

regions, with tenderness both in front and in the costovertebral angle. In this instance the urinary analysis showed no red cells, only albumin and a few leukocytes. The temperature, on admission was 102.4° F.; pulse, 120; leukocytes, 20,400. Although the temperature fell to 99.5° F. during the night, she was prepared for operation. An anterior incision was made, and the gall-bladder and appendix found to be normal. This was closed, and a lumbar cut revealed a large polycystic kidney studded with minute infarcts and small abscesses. As the toxic symptoms were already beginning to subside in this case, and as there was a strong probability of there being a polycystic and possibly imperfectly functionating kidney on the opposite side, we punctured several of the larger foci and stripped the fibrous capsule from the organ. She had a slow convalescence, complicated by an embolism of the third division of the right pulmonary artery. The recovery was, however, complete.

A woman, aged twenty-six years, complained of right-sided abdominal pain, with nausea, headache, fever, and general prostration. Ten days later she was admitted to the Roosevelt Hospital; temperature, 102° F.; pulse, 120; leukocytes, 19,000, of which 81 per cent. were polynuclears. She complained of a bearing-down sensation on urination. The following day the temperature rose to 104° F., 82 per cent. polynuclears on differential count. The patient was then cystoscoped. The examination of the bladder negative; ureters were catheterized, and from the right there was a scanty flow of urine, containing albumin, a few pus cells, and blood; from the left more abundant flow, few red cells, practically no pus. Physical examination revealed tenderness in the right costovertebral angle. The kidney was not palpated. Left side free from tenderness. Operation was performed by lumbar incision; edema of the perirenal fat. Kidney was highly congested and presented six distinct cortical areas of induration. Each of these were opened and packed with separate strips of gauze tape, which were allowed to protrude through the partly closed parietal wound. Of the six lesions, only one contained pus; the others, necrotic tissue. The renal pelvis was opened, the mucous membrane appeared normal. Cultures made from the pus showed the Bacillus coli communis. The patient made a tardy but complete recovery.

To remind my readers that one may occasionally be mistaken regarding the virulence of a given case, I will relate the history of a patient whose symptoms and appearance seemed to warrant treatment less radical than nephrectomy.

A married woman, aged thirty years, had a severe chill, followed by high fever, prostration, and abdominal pain. When seen by her attending physician, there was marked muscular rigidity and tenderness over the entire right half of the abdomen, the point of greatest tenderness being immediately over the middle of the ascending colon. When seen by the writer in consultation, there was also found marked tenderness in the right costovertebral angle. She was immediately transferred to the Roosevelt Hospital, where, upon examination, the urine was found to contain a trace of albumin, a few red blood corpuscles, and pus cells. Temperature was 103° F.; pulse, 120.

On exploring the right kidney by lumbar incision, it was found to be edematous and highly congested. Two or three fair-sized cortical abscesses were found and numerous smaller infarcts. The capsule was stripped from the kidney, the larger abscesses incised and packed with gauze, the wound partly closed, and an intravenous infusion of salt solution given. There was a marked temporary improvement in the symptoms. The temperature and pulse fell, and she seemed brighter, but the pain continued and she required morphine in considerable quantities for its relief. Two or three days later the temperature began to rise, the pulse increased in frequency, she became restless and delirious. We hesitated to remove the kidney on account of the uncertainty regarding the functional competence of the opposite organ.

Her sepsis continued to deepen, however, the tongue became dry and brown, the urine diminished in quantity, the delirium increased; she became more and more prostrated. As it was evident that she would surely die unless the kidney was removed, nephrectomy was hastily performed. The operation was associated with a considerable loss of blood from the slipping of a ligature on the renal pedicle. The loss was immediately made up by a large intravenous infusion of salt solution, which undoubtedly had a favorable effect on the profound toxemia. The relief was striking:

the pulse improved, the temperature gradually fell to the normal, the mind cleared, and convalescence was finally established. Although many months elapsed before she was completely restored to health, her recovery was, in the end, complete.

It remains for us to consider for a moment the mildest type of the disease, which requires no operation, and is of surgical interest only on account of the fact that it accounts for certain cases observed by all surgeons, in which, during or after a presumably typical attack of subacute appendicitis or cholecystitis, operation reveals no lesion or sign of recent inflammation.

The following case will serve as an example:

A young lady, aged twenty-five years, experienced an attack of right-sided abdominal pain, with fever, vomiting, tenderness and muscular rigidity over the right lower quadrant. These symptoms had been preceded by a subacute attack of follicular tonsilitis. Her attending physician regarded the case as one of appendicitis, and asked me to see her in consultation, with a view to operation. At the time of my visit the temperature was 100° F.; pulse, 110. There was a slight tenderness over McBurney's point, which extended upward nearly to the costal border. The muscles were moderately rigid. There was marked tenderness in the costovertebral angle. As no urinary analysis had been made, I declined to operate upon her, on the ground that, in my opinion, the lesion was a unilateral hematogenous renal infection. I ordered an examination of the urine, and predicted that a trace of albumin would be found, a few red cells, and pus, if the specimen was precipitated by the centrifuge. The analysis proved this prediction to be correct. The patient made a satisfactory recovery without operative treatment.

It is also of occasional interest in that it accounts for certain irregular periods of temperature occurring during convalescence from some surgical condition or infectious disease. In these mild cases pain is not often a prominent symptom, and may be absent, the only sign being unilateral costovertebral tenderness to pressure.

As an illustration of the latter condition permit me to cite the following case:

Mrs. X., aged forty-six years, was operated upon for subacute appendicitis in May, 1906. During convalescence, after the temperature and pulse had been normal for several days, she complained of headache, pain in the back and extremities, chilly sensations, and fever. The temperature rose to 101° F. or more, and the pulse was accelerated.

Examination of the wound area was negative, primary healing had occurred. Examination of the throat, ears, heart, and lungs revealed nothing abnormal.

During a rather careful and systematic examination of the abdomen distinct tenderness to pressure was found over the left costovertebral angle. This led to a careful examination of the urine, which revealed a trace of albumin, a few red and white cells. Cystoscopy and catheterization of the ureters later gave the characteristic signs of an acute infection of the left kidney, the secretion from the right side being normal. She made a prompt recovery from the acute attack, but signs of a mild chronic nephritis persisted for many months.

In conclusion, permit me to say a few words regarding diagnosis. The disease may or may not be ushered in by a chill. When present, it generally indicates a severe type of the infection. The initial rise of temperature is high, generally 104° or 105° F.; pulse is frequently 120 or above; the toxemia is marked from the first, and, with high fever, suggests often an acute grip, lobar pneumonia, or one of the exanthemata. Then follows a more or less vague pain in the abdomen or flank corresponding to the side of the lesion. Tenderness and muscular rigidity over the region of the appendix or gall-bladder leads often to error in believing one of these organs to be the seat of disease. As the urinary secretion from the infected kidney is greatly diminished and is largely diluted by the abundant secretion from the unaffected organ, the mixed urine, when passed or drawn from the bladder, is often quite normal in appearance, and the slight trace of albumin, blood, and pus is often overlooked unless a more than ordinarily careful examination is made.

The one pathognomonic sign present in all cases is a marked unilateral costovertebral tenderness.

DISCUSSION ON THE PAPERS OF DRS. ARMSTRONG AND BREWER.

DR. EMMET RIXFORD, of San Francisco, Cal.

As illustrative of some of the difficulties in diagnosis in such cases, I might mention the case of a patient who was operated upon for stone in the bladder. Death occurred some days afterward, and four ureters were found, in three of which there were stones. In another case, operated upon for subacute appendicitis with tumor, the tumor was found to be behind the peritoneum and independent of the appendix. The posterior peritoneum was incised after the removal of the appendix, and the tumor found to be the left kidney lying in the right iliac fossa. It was small and undeveloped, but normal in appearance. The right kidney was in place and was hypertrophied.

A matter of enormous importance is that shown in cases in which the removal of one kidney in the presence of double tuberculosis is followed by cure. One hesitates to suggest an explanation, but if the removal of a certain amount of tuberculous material will facilitate the healing of the process in the opposite kidney it must mean something. Possibly it may be produced by the hyperemia occasioned by the blood being forced into the kidney, somewhat after the way in which the Bier method cures tuberculosis of the extremities. If this thing occurs, may it not be possible to secure healing of small foci in tuberculous kidneys by other means than nephrectomy? Tuberculin may have a future in that direction.

DR. A. G. GERSTER, of New York.

The subject of primary and secondary hemorrhage in nephrotomy has been mentioned, and I have had some very instructive experiences with it. Whenever the pelvis of the kidney is opened by a large incision in the kidney, two forms of hemorrhage may occur. One is the parenchymatous form, or capillary bleeding from the cortical substance, which is easily controlled by direct pressure by the introduction of the finger. Another form is caused by the injury from the knife of one of the large branches of the renal artery at its first or second decussation. One of the gentlemen stated a very significant fact: that grave hemorrhage did not occur at the time, but nine or ten days after the operation. This I explain by assuming that here a large arterial branch was injured by the knife. Thrombosis occurred and caused cessation of the primary hemorrhage. But about the tenth day the infected thrombus broke down and was detached, thus causing secondary hemorrhage. In 2 cases I was compelled to remove the kidney after simple exploratory incision of the

pelvis on account of uncontrollable secondary hemorrhage. In one of these cases the pathological examination proved that one of the large branches of the artery had been divided half way, not completely. Those are the worst cases. Since that time I have abandoned entirely the use of the knife in opening into the pelvis through the kidney, and prefer the following method, which is safe, easy, and one which I can warmly recommend: The cortical substance of the kidney having been incised, the knife is laid aside. With a grooved director I push forward into the pelvis of the kidney. Along this I pass a dressings forceps into the pelvis. This instrument is opened and then withdrawn. The finger is inserted along the track which has been made not by cutting, but by tearing and stretching, to which the parenchyma yields, but the vessels resist. The pelvis is thus easily opened. Since the adoption of this method I have never seen one severe primary or secondary arterial hemorrhage in nephrotomy.

Dr. Frederic Kammerer, of New York.

I should like to put on record 3 cases of unilateral infection of the kidney which I have observed since January, in which the examination of the urine gave very little indication of the gravity of the process which had developed in one kidney.[1] All the cases came into the hospital with high septic temperatures and marked depression. In all of them the chief symptom was that spoken of by Dr. Brewer, the costovertebral pain, especially when bimanual examination in the lumbar region was practised. In 2 of the cases a nephrectomy was done; in the third case, after splitting the kidney, drainage was established by gauze packing, as the lesions appeared too slight to warrant removal of the organ. The result of this procedure was considerable anxiety during the after-treatment, owing to continued bleeding from the wound for several days following operation, and the continuation of septic temperatures for several weeks. Finally the patient recovered. The cases are the following:

[1] Since the meeting at Richmond I have operated on another typical case of hematogenous infection of a right kidney. The catheterized specimens from both kidneys were alike—a very faint trace of albumin and a few white corpuscles representing the only pathological findings. This patient was seen by a number of consultants during the five weeks of her illness before operation. Outside of irregular temperature, as high as 105°, the very slight change in the urine, a kidney not very sensitive on firm pressure, but lying below the costal margin, there were no symptoms. After nephrectomy the temperature immediately dropped to normal, and has remained there since. The organ removed was full of septic infarcts.

CASE I.—L. B., female, aged twenty-nine years. No family history. Miscarriage six months ago; since then occasional pain in small of back, headache, and vaginal discharge. Menstruation regular. For past two weeks has felt very ill, and has been in bed; during this time has suffered from a frequent desire to pass water, and some pain in region of right kidney. Says she has lost weight during past two weeks. On admission to the hospital she was emaciated and anemic; blood examination showed 20,000 white blood corpuscles and 82 per cent. polynuclears. Temperature, 102°; pulse, 110. Physical examination absolutely negative, with exception of slight enlargement of right kidney, which organ was very sensitive to bimanual pressure. In the catheterized specimen from both kidneys, there was a faint trace of albumin and nothing else. During the next three weeks, while she was under close observation, she suffered from a septic, remittent fever, the temperature occasionally reaching 105°. On January 20 there were only 8800 white blood corpuscles, with 60 per cent. polynuclears. The patient complained of slight pain in the region of the right kidney, which was very much aggravated by palpation of that organ. On the following two days the patient's temperature reached 105°. On January 23 the kidney was exposed by lumbar incision; after cutting into the capsule a number of miliary abscesses were seen on its convex border; the organ was somewhat enlarged, nowhere adherent, and its removal was very simple. The patient made an uninterrupted recovery; the temperature reached 101° on the day after operation, but on the next day was normal, and continued so in the further course of the case. She is entirely well now, three months after operation.

Gross Appearance of Kidney after Removal. Kidney somewhat enlarged, surface roughened; capsule adherent in places. Under capsule the surface presents many large and small yellowish raised areas, surrounded by congestion zone. There are a few depressed areas with yellowish base. Cut section shows four oval-shaped, raised areas in cortex and medulla extending almost into pelvis. Each is made up of yellowish streaks, following direction of the tubules, separated from one another by red lines. There are no cavities, though softening has begun in places. There are a few small miliary abscesses on surface. Markings of organ are indistinct. Pelvis appears free from involvement.

CASE II.—B. K., female, aged thirty-nine years. Negative previous history. Has been feeling ill for past three months, with symptoms of dyspepsia. A week ago she menstruated at the proper time, when urinary symptoms began to develop (frequent micturition every half hour, burning pain on passing urine, and pain in right lumbar region). When admitted to the hospital April 10, the temperature was 102.6°; pulse, 102; abdomen, tense and rigid, especially in the upper parts;

severe pain, and indistinct feeling of mass in right lumbar region below costal margin; in the region of the left kidney no pain and no swelling. During the following two days the temperature reached 103° and 104.5°, falling to 100° in the intervals. The patient was in such a condition that cystoscopic examination was deemed inadvisable. The urine was acid, cloudy, contained a trace of albumin and some white blood corpuscles. On April 13 the region of the right kidney being exquisitely tender to the touch, that organ was exposed by a lumbar incision and easily brought out upon the abdominal walls; it was decidedly large; a vertical incision was carried down through entire substance of the kidney into the pelvis; at the upper pole a wedge-shaped infarct, as large as a walnut, with yellowish streaks of pus running through it, was found, and a second one, much smaller, at the middle of the incision. The incision into the kidney was filled with gauze, and large masses of gauze were packed about the entire organ to control hemorrhage. There was considerable oozing during the first two or three days, and the patient was in a precarious condition for some time. Her temperature continued high for weeks, and became normal only after about a month. For the first two weeks there was abundant drainage of urine from the kidney, but this gradually ceased. On June 26 the patient was discharged from the hospital with a small fistula still secreting pus, but no urine from the nephrotomy incision. She was in excellent physical condition. During the last four weeks of her stay in the hospital the urine always showed a faint trace of albumin.

A small piece of the infarct at the upper pole of the kidney was excised at the operation.

Pathological Diagnosis. Suppurative nephritis.

Bacteriological Diagnosis. Atypical colon bacillus found in excised portion.

CASE III.—J. B., aged sixteen years. Family history negative. Has never been ill. Two weeks ago caught cold, began to cough and expectorate, and had severe pain in lower part of left chest; for past week chill every night, followed by fever and profuse sweating. Admitted January 3. Examination shows nothing but a sensitive left kidney, which seemed larger than normal; temperature every evening up to 103° to 105.8°, until incision of a perinephritic abscess on January 16. Temperature somewhat lower for a few days, but septic conditions continued, therefore nephrectomy on January 29.

Pathological Report. Kidney one and one-half times normal size, lobulated, dark purple in color; at upper pole, involving cortex and medulla and extending to pelvis, a mass of thick greenish yellow pus (from which cultures had not been taken); this mass embraces the greater part of the upper poles; a few scattered miliary abscesses are

found over surface of kidney; cortex of the organ much thickened; markings very indistinct.

The further course of the case was encouraging. The septic condition seemed to subside, the temperature gradually receding until it was practically normal by the end of March. On January 6 and 10 blood cultures had been negative. On February 6 a long-chained streptococcus was isolated, and several abscesses were opened in the back and over the left hip containing streptococci. Lately some new metastatic abscesses have been forming, but the patient's general condition seems better.[1] The urine before nephrectomy was acid, slightly cloudy; it contained a few white blood corpuscles, no albumin or sugar; it remained about the same in character after the nephrectomy. Evidently the large septic focus in the upper pole of the affected kidney, though reaching to the pelvis, had not perforated into it.

From my own experience I think nephrectomy is the only justifiable operation in these early cases with severe toxemia, a fact to which Dr. Brewer has called attention. I do not believe that a wedge-shaped infarct can be properly drained by simply stripping the capsule from the cortex of the kidney, nor will bisection of the organ accomplish this end, more especially when only a few of the infarcts, in which suppuration has scarcely begun, are opened up. I feel that I subjected my second case to considerable risk by simply doing a nephrectomy.

Dr. John H. Gibbon, of Philadelphia.

There is no doubt that the *x*-ray plates are a most valuable means of diagnosticating ureteral calculi. The shadows shown must be confirmed by clinical symptoms, however. That other things than stone will cast shadows we know. In one case in which a diagnosis of appendical abscess was made, in spite of marked urinary symptoms, the *x*-ray showed an oblong shadow in the line of the ureter, but operation revealed the appendical abscess with a hard concretion and no ureteral stone.

The constant or intermittent presence of microscopic blood is a diagnostic sign of the greatest importance.

Making a diagnosis of the location of these shadows by means of a metal ureteral bougie is fraught with danger, especially in the hands of inexperienced men. I think we ought to discourage introduction of metal bougies into a ureter which may be the seat of disease. So good

[1] The patient has now (June 24) developed a streptococcus septicemia. Metastatic abscesses are continually forming in all parts of the body, and the case will evidently terminate fatally in a short time. At no time have any symptoms pointed to an involvement of the remaining right kidney.

a man as Noble has reported a case in which he has opened the ureter with a soft bougie, not a metal one. If this can be done with the ordinary bougie, I think the introduction of the metal bougie ought to be undertaken with extraordinary precautions.

In the May (1908) issue of the *Journal of Surgery, Gynecology, and Obstetrics* I have advocated the combined intra- and extraperitoneal method to remove ureteral calculi, basing my conclusions on an experience of 7 cases. The two great advantages of this method are the time saved and the small amount of traumatism. In my last case of stone, in both ureters in a small boy, I was able to use the combined method on one side and the extraperitoneal on the other, removing the stones in twenty minutes. In 3 of the operations the extraperitoneal method alone was employed, and in 4 the combined intraperitoneal exploration with extraperitoneal removal of the stone, and all recovered. In my first 2 operations there was a leak of urine, and in the last 4 no leak. It makes little difference whether or not the ureters are sutured after the removal of stone. I think, however, we should use a small drain. The packing of a drain, especially a gauze drain against the ureter, invites leakage, and, therefore, I would advise that it extend to, but make no pressure upon, the ureteral wound.

Dr. Charles L. Gibson, of New York.

I should like briefly to report a case which has features similar to those described by Dr. Brewer. It is that of an Italian woman suffering from acute sepsis without obvious cause. Examination of the urine showed only a very slight trace of albumin and some pus cells. The woman was kept under observation without a definite diagnosis for some time. She had frequent, irregular chills, the temperature going above 106°. Physical examination elicited only some tenderness over the left kidney region. Catheterization of the ureters could not be carried out. *X*-ray examination was negative. The left kidney was exposed by lumbar incision. The kidney was normal in size and outline, but after decapsulation minute miliary deposits were seen at each pole. About a fifth of the kidney at either pole was removed, leaving sound tissue. There was little bleeding, easily checked by packing. The woman made a good recovery, the symptoms subsiding almost from the time of operation. In the course of a month she entirely regained her health. The case is interesting in showing the value of conservative treatment. I have also had an equally satisfactory result on the treatment of a tuberculous focus in the same way.

Dr. George Woolsey, of New York.

Reference has been made to false shadows shown in *x*-ray plates, but only one reference has been made to negative plates. I have had 2

cases where the stones in the ureter were very small, and in both cases I have had repeated plates prepared by an *x*-ray expert. They showed all the details considered necessary, but no shadow was shown. One of the cases came to me with the diagnosis of acute appendicitis. I was urged strongly by the patient's relatives and friends to operate for appendicitis, but I refused to do so because the pain and some other symptoms led me to diagnosticate ureteral calculus. The *x*-ray plates were negative, and I had to make the diagnosis on the clinical symptoms, as Dr. Richardson has urged. The result proved the correctness of the diagnosis, for a small stone was passed on the fifth day. I do not, therefore, feel that a negative plate, even if considered a perfect plate, taken by an expert, is at all a sure sign of no stone.

We owe to Dr. Brewer a debt of gratitude for presenting a new field of pathology and treatment in kidney lesions. In a very limited experience in this field (only 2 cases operated on) I have found the lesion he speaks of, and have obtained cure by nephrectomy. One was not a complete nephrectomy, for the lesion was confined to the lower pole of the kidney, and I was, therefore, able to remove the lower half and leave the upper half. In both cases there was a palpable tender mass in the region of the kidney below the costal margin. In both cases the symptoms began acutely and then became subacute.

Dr. Arthur Dean Bevan, of Chicago.

I am glad that the question of diagnosis was emphasized by Dr. Richardson and a number of the Fellows. I think it is of the utmost importance, and in my paper I devoted more than half of the time to its discussion, regarding its importance in this order: (1) Gross clinical picture, including history; (2) careful examination of the urine, chemical and microscopic; (3) *x*-ray examination. I find, in teaching my students, great difficulty in overcoming what I call the laboratory habit and instilling into their minds the clinical habit. We have men come to us with four years of good preparatory training, and they try to follow out that laboratory training in their clinical years, and it is with great difficulty that we can impress upon them the importance of the gross clinical picture. In kidney stone the gross clinical picture is the great important factor in diagnosis, just as it is in stomach, gall-bladder, and such conditions. In answer to Dr. Nancrède, I would say that the *x*-rays are not infallible for kidney stone, but that good *x*-ray work can be relied upon in nine-tenths of the cases. When you discuss the question of diagnosis, this is to be said: that diagnosis is arrived at by a process of exclusion and then this should be confirmed by the *x*-rays.

In the operative treatment the advance will be made in the complete cure of the patient and in making secondary operations unnecessary.

In considering the question of nephrectomy, I rely greatly upon the total output of urea. I think the questions of cryoscopy and cystoscopy examinations are of some importance. These methods are to be considered in certain individual cases. I do feel that it is very important to decide upon the character of operation to be made in the individual case. In the majority of cases of kidney stone there is a single stone in the pelvis. I think all statistics agree pretty well on that point. When the *x*-rays show clearly a single stone in the pelvis I am quite convinced that the choice of operation is pyelotomy, with or without closure of the line of incision in the pelvis. The mere fact that these incisions leak for a few days is not any argument against this operation. In cases where you have branched stones, multiple stones, and suppurative processes, the question of nephrotomy or nephrectomy arises. When there is considerable kidney left, operation should be done by nephrotomy. It is important to decide at the time of operation whether nephrectomy should be done, and whether in the event of doing nephrotomy a secondary nephrectomy may be necessary. On that point the information of greatest value must be decided by determining before hand the total urinary output of the individual, as shown by the amount of urea, etc., and comparing that picture with the gross picture of the involved kidney found at the time of operation. It is well known that when one kidney is greatly destroyed the other undergoes hypertrophy, and when you find a kidney thus destroyed and the output of the urine of the individual normal, it should be removed. I want to emphasize the fact that a great many of these cases can be operated upon under nitrous oxide gas. This is an exceedingly important point, because I believe that in these kidney cases the nitrous oxide gas is very much safer than ether or chloroform.

Dr. M. L. Harris, of Chicago.

In speaking this morning of the segregator, I omitted one important point—that the urine taken by the segregator drops in a characteristic manner from the two sides. When you are removing urine from two kidneys it never comes continuously, but always intermittently. So whenever you get urine dropping from the two sides synchronously, whether the amount is the same or not, it is always an indication that there has been an improper adjustment of the instrument or that an anomaly is present.

REPORT OF A CASE OF STONE IN THE BLADDER, ASSOCIATED WITH INTERMITTENT PNEUMATURIA FOR THREE YEARS, AND THE SUBSEQUENT FORMATION OF FECAL FISTULA.

By A. T. BRISTOW, M.D.,
BROOKLYN, N. Y.

The phenomenon of pneumaturia seems to be more common than a perusal of works on general or special surgery would lead us to expect. The writer has been unable to find any mention of the subject in the standard works, with the exception of Kelly's volume on appendicitis, in which he cites two cases of pneumaturia occurring as a sequel and complication of the disease. In one of these cases (Musham's), following a third relapse, the appendix ruptured into the bladder. As a sequel, large quantities of gas were expelled with the urine, together with much pus. At the operation, the appendix was released from its adhesions, but no point of perforation could be found. The cystitis which occurred had, as a result of the infection of the bladder from the intestinal tract, persisted for two months, when it subsided, and for a time the patient appeared to be well; but after an interval the urine became turbid again and was found to contain plant cells and undigested animal fibers. About a year after the first operation a median incision was made and a connection between the cecum and bladder was found. The repair of the fistulous openings was followed by complete recovery.

Although little mention of pneumaturia is made in the text-books, a search of current literature shows that many cases have been reported in the last twenty-five years. In an article pub-

lished by Kelly and MacCallum, in the *Journal of the American Medical Association* for August 20, 1898, in the bibliography at the end of the article, 22 cases of pneumaturia, due to the presence of gas-forming bacilli in the genito-urinary tract, are cited, and 184 cases due to fistulous communication between the intestinal tract and the bladder. It seems strange that, with such a wealth of literature on the subject, so little notice of this complication has been taken in the text-books. It will be seen that the vast majority of cases of pneumaturia are due to the establishment of a fistulous connection between the bladder and the bowel. Nevertheless, quite a number of cases of what one may term intrinsic pneumaturia have been reported, and it is, therefore, of importance, in those cases in which there is simply an escape of gas with the urinary stream, to determine whether the phenomenon is due to the formation of gas in a suppurating kidney—one case of which was reported in the article above mentioned—or to the formation of gas in the bladder. When this latter phenomenon is present, it almost always is due to the decomposition of diabetic urine, with the consequent formation of carbon dioxide and alcohol. To distinguish between these different conditions may be very simple, as, for instance, in Kelly's case, in which large quantities of gas, with a discharge of pus, was seen to escape from the left ureter. Operation in this case disclosed a suppurating kidney, which contained quantities of gas. The bacteriological examination, however, failed to isolate the organism which was responsible for the pneumaturia. On the other hand, the case which the writer desires to report illustrates the fact that it is possible for the fistulous communication between the bowel and bladder to be so narrow as to permit the escape of gas from the bowel, but without the appearance of feces in the urine and without the occurrence of cystitis.

The history of this case covers nine years, and is as follows: A gentleman, aged thirty years, consulted the writer in December, 1903, and stated that four years previously he had been seized with a severe pain in the right side of the abdomen. This soon became intense, and was associated with distention and muscular spasms, so that the physician who was in attendance suspected an attack

of appendicitis. It was finally, however, pronounced to be a right ureteral colic, with reflex abdominal symptoms. From that time until August, 1903, the patient remained perfectly well. Then a brick-red sediment appeared in the urine, which later became clouded. The patient also passed from time to time what he described as pieces of flesh. On two occasions his urine was extremely offensive, the odor being described as resembling the odor of asparagus urine or urine which was very stale. Late in August, while urinating, the patient was seized with a very severe pain, and took to his bed for two days; during this period every act of urination was painful, but the severity decreased, till, by the third day, the pain had disappeared. The urine was examined at this time by competent pathologists, and was found to be acid in reaction, containing urates and phosphates, but neither bladder epithelium nor pus. The first week in October he began to pass small quantities of blood at the end of urination. He also had three attacks of vesical spasm, ten days apart, each attack lasting for about a day. The urine now contained pus and blood, but continued to be of acid reaction. The attacks of pain ceased, and the patient resumed his business, travelling by rail twenty-five miles a day to the city and returning at night without inconvenience; he was also able to play golf. Late in November the patient noticed that the stream of urine was interrupted by bubbles of gas; this was of daily occurrence for about six weeks. It was invariably with the morning urination, and on one occasion the noise of the sputtering urine was heard in an adjoining room. In December the pain returned with some severity; also the bleeding, which became more profuse. The patient was now brought to the city by his brother, a physician, and seen by the writer. On examination, the right iliac fossa was quite tender on palpation, although no mass could be made out, nor anything resembling an inflamed appendix. The evening temperature was 102, but fell to normal, from which it rarely deviated. Besides the tenderness, the patient also complained of pain in the same locality. Deep massage along the right ureter was made, but nothing like a hydronephrosis could be detected. The day following this examination the patient

brought to the writer two long ureteral casts, which, when first seen, much resembled lumbricoid worms; they were in alcohol, however, and the patient said that they were bright red when first passed; closer examination showed them to be blood clots decolorized in the alcohol. After the passage of these casts the rightsided pain ceased, as did the tenderness, but the pain on urination continued. Rectal examination disclosed a slightly enlarged prostate, which was, moreover, exceedingly tender. Some pus appeared in the urethra after massage of the prostate, but microscopic examination of this failed to show any specific organism, and the patient was absolutely without any venereal history. The urine showed pus in large quantities and blood, but remained acid in reaction. As an uncle of the patient had died of tuberculosis, it seemed wise to exclude the possibility of a tuberculosis of the bladder or kidney by inoculation tests before introducing any instrument into the bladder in order to avoid the possibility of a secondary infection. A guinea-pig was therefore inoculated with a small portion of centrifuged urine and killed at the end of six weeks. Examination of peritoneum was negative, but caseous bronchial glands were found; these, when examined, were found to be negative. A second inoculation gave entirely negative results, and tuberculosis of the genito-urinary tract was therefore excluded. The patient had, meanwhile, been improving rapidly; the blood and pus had disappeared from the urine, and the pneumaturia had ceased; the patient had also gained ten pounds in weight. A Thompson searcher, passed into the bladder, immediately disclosed a small stone, about the size of a chestnut. It was evident, however, that two symptoms still remained unaccounted for: the ureteral casts and the pneumaturia. In order to settle the question as to whether the gas was formed by the urine itself, owing to the presence of some gas-producing bacillus in the bladder or kidney, it was, on several occasions, put into a fermentation tube and allowed to remain in an incubator for twenty-four hours, but always with negative results. Up to this time also all examinations for the colon bacillus, whether by culture or smear, had given negative results. Cystoscopy and radiography were

now invoked for the purpose of determining, if possible, by the cystoscope, whether there was any appearance in the bladder suggesting fistulous tract communicating with the appendix or bowel; by a radiogram, whether there was a stone in the kidney or ureter as well as in the bladder. The stone in the bladder was clearly seen by the cystoscope in the hands of Dr. Tilden Brown, of New York, but nothing else abnormal was discovered in the bladder wall, which was pale and, considering the presence of the stone, singularly free from all evidences of irritation. A radiogram clearly showed the stone in the bladder, but no evidences of calculus on the right side either in kidney or uterer. A small shadow appeared on the plate, however, low down on the left side of the pelvis, near what would have been the vesical end of the left ureter. This was thought to be an artefact, as the patient had never had any pain in the left side. The ureters were not catheterized at this time. The writer now determined to remove the vesical calculus by suprapubic cystotomy and to carefully inspect the bladder for any evidence of fistula. The operation was brief: the bladder was dilated with air, after the writer's method, and the small stone was removed. No evidence of a fistulous opening being discovered, the bladder wound was closed by suture, as was the skin incision, with the exception of a small drain at the lower angle of the wound to provide against possible leakage. The catheter à demeure was removed on the third day, and the patient left the hospital on the tenth day for his home. For six months he remained perfectly well, when he had a brief return of the pneumaturia for forty-eight hours, the gas escaping, not with every urination in that interval, but two or three times each day. No pain. The pneumaturia then ceased. Once, during October of 1904—eight months after operation—the patient had an attack of pain in the right iliac region; and late in November, while at Lakewood, a similar attack. During the October attack the patient had some tenderness in the iliac fossa, without fever or muscular spasm. With the pneumaturia, and following it, pus reappeared in the urine, after a short interval, however, again disappearing. From November, 1904, until October, 1905, a period of eleven months, the patient re-

mained perfectly well, taking a trip to Europe in the summer of 1905. A letter received from the patient in October, 1905, may be condensed as follows: "Trip to Europe, June 28; returned September 1, without an hour's illness; gained ten pounds in weight. Four days after return, while playing bridge one night, was seized with severe pain in the right side and had to be helped upstairs. Had a severe chill and intense pain all night. On the third day, however, was able to get up and be about. Pain ceased entirely with the exception of a severe pain, which comes at the end of the penis on urinating and continues for about half an hour afterward. Urine was stringy, with pus, and two weeks after blood appeared again in the urine." Patient lost eight pounds in this illness, during which he was not seen by the writer. Patient also wrote that he thought that a stone might have passed from the kidney to the bladder, the attack having been brought on by playing golf; he also stated that one night he knew, when urinating, that he was going to pass gas with urine, and actually did so. The patient, on recovery from this attack, early in November, was taken to Dr. Tilden Brown, of New York, for ureteral catheterization; urine collected from both ureters and from the bladder found to contain the colon bacillus and pus in microscopic quantities. A styletted ureteral catheter introduced into the left ureter showed that the small shadow which had appeared uniformly in all the several plates which had been taken was neither in the ureter nor close to it; pus could not be seen in visible quantities issuing from either ureter, and the urine was now clear. The patient had a moderate organic lesion of the heart, and his business affairs were in such a position that he was unwilling to submit to exploratory laparotomy, unless he was clearly in danger of his life. In January, 1906, he had another attack similar to that in October, with chills, high fever, and right-sided pain; this illness lasted ten days; patient passed some gas again; was not seen by the writer, owing to his residence in another city. In May he went to Europe, and, landing at the Azores, took a gallop on a donkey, and that day passed gas in quantities but without pain; this was on May 17. The pneumaturia ceased in two days. On June 18, while in Venice,

and after ten days of rest, the patient had a severe pain at the end of the penis, after which he passed a quantity of blood and pus. No pneumaturia nor pain in the abdomen. This attack was described as one of the sharpest attacks which had happened. On July 4, after a violent game of shuffleboard, patient passed gas again, but had no pain. On January 29, 1907, the patient writes that he felt an attack coming on, with a kind of bearing-down pain in the whole lower part of the abdomen; for the first time, no pain transmitted to the penis; nor was there any spot on either part of the abdomen which was specially painful; abdomen sore all over. There was no rise of temperature, but more pus came each time the patient urinated; passed gas, however, with a rush; urine was pretty clear in the daytime, but thick with pus every morning. An examination of the urine passed at this time showed some vegetable fibers, and it became perfectly evident that at some point there was a communication between the intestine and the genito-urinary tract.

From that time to the present the history of the case has been entirely clear, as a fecal fistula definitely established itself, the orifice of which can be seen by the cystoscope, about one inch above the right ureter. At present the amount of fecal material is much less than it was a month or two ago. Recently the patient sent to the writer a small vial of urine which contained shad roe, with a note to the effect that he had eaten the roe at 5 P.M., and that it had appeared in the urine discharged at 11 P.M. of the same evening. A noteworthy fact connected with this remarkable case appears to be the extraordinary tolerance of the bladder. So far as is known to the writer, all cases of vesico-enteric fistula have been characterized by a furious cystitis. Nothing of the sort inconveniences the patient, his urine continues to be acid, and he apparently suffers no inconvenience from the fistula. In January he had some symptoms indicating a pyelitis of the left kidney, but these rapidly subsided after a day or two. Although warned of the certainty of an ultimate double pyelonephritis, for the present the patient absolutely declines an operation, because he feels perfectly well. In fact, he goes to business every day and has put on weight.

As one reviews the complete history of this case, now that all the clues are unravelled, the diagnosis seems to be sufficiently plain. An attack of appendicitis nine years ago, mistaken for renal colic, during which the appendix became attached to the bladder; then an interval of quiet for four years, followed by the establishment of a long, narrow, fistulous tract between bladder and colon by way of an almost obliterated appendix; the formation of a stone about a tiny particle of slough, which marked the establishment of the fistula; the closure of the tract for long periods, perhaps by mild inflammatory processes; the recrudescence of the trouble about the region of the appendix, at long intervals; finally, the establishment of a permanent fistula. But this does not explain the ureteral clots, and it is within the bounds of possibility that the stone in the bladder was originally of renal origin. The case cannot be entirely cleared up until the patient submits to operation.

A number of cases of pneumaturia from vesico-enteric fistulæ have been reported in women. These have usually been the result of pelvic peritonitis, during which the bowel has become attached to the bladder, the fistula following as a result of direct infection from the damaged bowel to the detached bladder wall.

To sum up: Pneumaturia may be intrinsic; that is, originating entirely within the urinary tract; or extrinsic, in which it is due to communication between the urinary tract and the intestines. In the intrinsic cases we must distinguish between those cases in which the pneumaturia originates within the cavity of a suppurating kidney, and is due to a secondary infection by one of the gas-producing bacilli, and the more common cases, where a diabetic urine is decomposed within the bladder itself into CO_2 and alcohol. The former condition is curable by surgery, and the cystoscope, of course, offers the means of diagnosis, as in Kelly's case. When the pneumaturia is extrinsic in origin, we must distinguish between those cases inflammatory in origin, which are curable by operation, and those which are due to the eroding process of the carcinoma in the pelvis which has opened up a communication between intestine and bladder. With regard to the inflammatory cases, the only difficulty will be in determining the point of communication be-

tween the urinary tract and the bowel. This might be as high up as the transverse colon, or at some point on the ureter itself, or into the bladder. At one time, in the case which has been narrated, it seemed possible that a stone in the ureter might have ulcerated and made a communication between bowel and ureter; such an hypothesis explains some of the symptoms. When the fistula has been between rectum and bladder (of which some instances have been reported), milk injected into the rectum promptly appeared in the urine. Methyl blue has also been used, but seems open to the objection that after an interval it would appear in the urine without the existence of a fistula from absorption alone. The administration of bismuth and a subsequent radiogram might possibly be of help. Authors seem to be divided as to the chemical composition of the gas in these cases of pneumaturia. H_2S is readily soluble in water, so we should not expect this gas to be expelled as a gas, but rather in solution. In fact, a number of cases of hydrothionuria have been reported. Scott has an article in the *New York Medical Journal*, June 17, 1893, in which he reports four cases, three of which were *postpartum*, and one followed a laparotomy for pus tube. One woman furnished two cases, the hydrothionuria occurring after two successive labors twenty months apart. The odor of sulphuretted hydrogen was overpowering in these cases, but there was no pneumaturia. Chemical tests of the urine proved the diagnosis. It does not seem likely that H_2S would escape solution in the urine. In fact, in an article by Friedrich Müller(*Berliner klinische Wochenschrift*, October, 1889, No. 41), the analysis of gas in a number of cases of pneumaturia showed a preponderance of nitrogen, next in quantity being hydrogen and CO_2. A trace of H_2S was found by Ruge. The article is commended to those who are interested in chemical composition of the gas expelled in such cases.

DISCUSSION.

DR. FREDERIC KAMMERER, of New York.

Many years ago a case came under my observation with a large appendicular abscess which I opened, and which healed completely in a month and one-half, but in the course of convalescence a severe cystitis developed which resisted all efforts at cure. Six months later the patient again presented herself on account of her urinary troubles. The urine was acid, contained no renal elements, but a considerable amount of pus and minute phosphatic concretions. Cystoscopy showed on the right side of the bladder a large, deep, irregular ulcer in the mucous membrane, with well-defined edges. Small incrustations of phosphates were clearly detected at various points about and in the ulcer. The mucosa of the bladder was otherwise pale and to all appearances normal. The cystoscope was retained in position for a long time, but no discharge of pus into the bladder was observed, although firm pressure was exerted upon the abdominal walls. Another abscess developed at the site of my first operation nine months later. I operated upon this abscess, and this time removed the appendix. The tip of the appendix was firmly adherent to the right side of the bladder. I could not determine whether the appendix opened directly into the bladder or not. The patient eventually recovered, and a further examination with the cystoscope showed that the ulcer had entirely healed, and only a small cicatrix indicated its former site. It seems to me certain, from the course of the case, that the lumen of the appendix communicated with the bladder, although the conditions at the second operation were such that this communication could not be demonstrated.

DR. ARTHUR DEAN BEVAN, of Chicago.

One of the specimens which I show was from one of my fatal nephrectomies. Before operation there was found a large mushroom-shaped mass of granulation tissue at the site of the fistula. The *x*-rays showed a number of stones, and nephrectomy was done, though with much difficulty. In the kidney there was found a stone which had penetrated the duodenum. The man died of hemorrhage of the lungs about the sixth day. At postmortem was found extensive septic infarcts of both lower lobes, and upon examination of the abdomen a perfectly clean peritoneal cavity, but posteriorly an opening into the duodenum, which had been produced by the ulceration due to the stone. Possibly Dr. Bristow's was a somewhat similar case. We have had one case in our experience of gas in the urine, and *x*-ray examination showed beautifully an enormous kidney with the calices distended by the gas, just as is

sometimes seen in an *x*-ray picture of the distention of the cecum. The man had suffered for years. I did a nephrectomy, and found that the gas evidently was caused by a gas-forming bacillus.

Dr. George Emerson Brewer, of New York.

While it is an exceedingly rare complication, there is no particular reason why such cases may not be due to a diverticulitis of the colon as well as to appendicitis. Sidney Jones reported an autopsy on such a case half a century ago.

Dr. Emmet Rixford, of San Francisco, Cal.

Dr. Brewer's suggestion, as to the possibility of pneumaturia being due to perforation of an intestinal diverticulum, recalls a case in which a diverticulum from the rectum perforated into the bladder, permitting the discharge of gas and fecal matter with the urine. The patient was a man, aged sixty years, who had suffered with recurrent attacks of abdominal inflammation. He died as a result of peritonitis which followed a dose of castor oil given in preparation for operation. Autopsy showed a pelvic abscess opening into peritoneum and bladder and communicating with the rectum by means of a diverticulum.

Dr. George Woolsey, of New York.

Some years ago a man was brought to me with the diagnosis of moderate stricture of the urethra and a urethrorectal fistula, probably following a prostatic abscess. Rectal examination showed a mass behind and to the left of the rectum which rendered rectal exploration high up practically impossible. Every few weeks he would be taken with pain in the bladder, followed by rise of temperature, and then there would be pneumaturia with pus and a little fecal matter in the urine. With the passage of the gas and fecal matter the symptoms of cystitis subsided in a few days. A v. Dittel incision showed no fistulous communication between the rectum and the prostatic urethra, that had been diagnosticated, but the mass behind the rectum could not be satisfactorily reached through the perineum. He did not return according to promise for a posterior operation, because the division of the stricture enabled him to pass a catheter when the attacks came on, and thus he was speedily relieved of pain and other symptoms. I have often thought that this case might have been one of diverticulitis following down from the sigmoid to the rectum.

Dr. Bristow. Regarding the possibility of diverticulitis, I think my patient is rather under the age when this would be probable. He is only thirty-five, and has had the trouble since he was twenty-four. It seems

to me that the character of the specimens excludes the probability of the communication being with the lower bowel. The specimen is not true fecal matter, but bile-stained and coagulated albumin. There is not the slightest doubt that there is a communication between the urinary tract and the bowel. Just before I came away the patient telephoned me that he could send me a specimen containing asparagus fibers.

A CASE OF MELANOTIC SARCOMA OF THE COMMON BILE DUCT AND THE AMPULLA OF VATER.

By FRANCIS J. SHEPHERD, M.D.,
MONTREAL, CANADA.

The rarity and obscurity of this case constitutes my apology for reporting it.

Mr. A. S., aged forty-four years, bridge engineer, consulted Dr. A. E. Morphy, of Lachine, P. Q., in June, 1907, for severe itching all over the body, but especially about the chest and back. On examination a very faint tinge of yellow was observed on the skin and conjunctivæ. There were no digestive disturbances, but distinct loss of appetite. A few days later the jaundice deepened and the itchiness increased. There was no pain, but the patient complained of loss of strength, great lassitude, and much depression of spirits. There was also constipation. On physical examination, when first seen by Dr. Morphy, no abnormal condition about the liver was discovered; everything seemed normal.

About the middle of July a smooth, rounded, painless swelling was made out in the region of the gall-bladder. This was looked upon as a distended gall-bladder. All this time there was abundant bile in the urine and the stools were colorless and very fetid, except occasionally when they had a chocolate hue.

Mr. S. was admitted under my care as a patient in the Montreal General Hospital on July 26, 1907, the following being his history: A tall, spare man, of very fair complexion; had never been ill before in his life, and had always been most athletic, being very fond of outdoor sports. He was in his usual health until May 15, 1907, when his feet began to itch at night. This itching spread all over his body, and very soon (early in June) his conjunctivæ

became yellowish in color, and then his whole skin became jaundiced. The color deepened rapidly, and at the time this note was made his color was more yellow than it had previously been, the itching was less troublesome, but he complained of great depression and weakness. He never had any severe pain in the abdomen, nor headache, but complained of a sensation as if a rope were being tied about his abdomen below the costal margin, accompanied by a dull ache, especially severe when he took a deep breath.

Examination showed that his lungs and heart were normal. The urine contained bile, but no sugar or albumin; the bowels were constipated, stools foul and colorless. Never had any vomiting or fever. Has lost about thirty-five pounds since illness commenced. Pulse slow, 58. On examination of the liver it was found to be slightly enlarged, and a fulness was felt in the region of the gall-bladder, but no distinct tumor was made out.

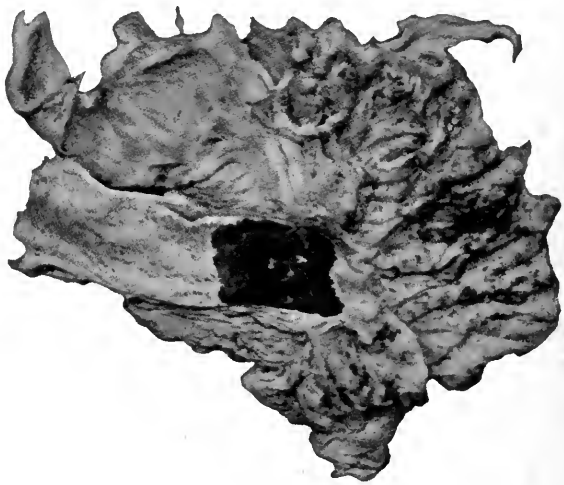
A question arose as to the cause of this condition, and it was felt that it was due either to gallstone in the common duct or to malignant disease. An exploratory operation was advised, and on July 30 the abdomen was opened by a vertical incision through the middle of the right rectus muscle. The gall-bladder was found fairly distended, but no stone could be felt, nor could any nodules or enlarged glands be made out in the common duct, nor was any thickening or infiltration felt. The head of the pancreas was somewhat hard, but nothing definite was discovered, so the gall-bladder was opened and a lot of thick, dark colored bile evacuated mixed with mucus and a dark substance of the consistence of mud. A drainage tube was left in and nothing more done. My conclusion was, from having had a somewhat similar case the previous year, that a soft secondary malignant growth was blocking the common duct below the junction of the cystic duct, but on careful examination no primary growth could be discovered anywhere. The rectum was normal, and apparently all other parts also. It was a puzzling case, and explanation was difficult. The tube discharged much bile and his jaundice cleared up considerably, but he continued getting weaker and was more difficult to feed.

A month after the operation his left parotid began to enlarge,

and soon after pus came from the left ear; a large abscess formed, which was opened and discharged freely, and much necrosed tissue was taken away. Another abscess formed in the submaxillary region and caused a considerable increase of his debility. He finally died on September 6, 1907, of exhaustion.

An autopsy was allowed, and the following is an abstract of the findings as reported by the Pathologist of the Hospital, Dr. Duval.

"Autopsy performed fourteen hours after death. In the region of the gall-bladder there is a linear scar 10 cm. in length parallel to the median line. Through the scar runs a fistulous tract, which



communicates with the gall-bladder and on pressure discharges bile. The inner surface of the gall-bladder appears normal. The cystic duct, opened in situ, is distorted into a shape like the letter S, apparently the result of old adhesions. The wall of the cystic duct is of normal thickness and its inner surface smooth throughout. On opening the common duct it is seen uniformly dilated to three times its normal caliber. Its wall is somewhat thinned and the rugæ of the tunica propria present a marked fenestration, due probably to long-continued distention. In the lower portion of the duct there is a soft, brownish black, fungoid mass, 2.5 cm. in length,

which completely occludes the lumen of the common duct and part of Vater's diverticulum. The passageway to the duodenum, however, is patent and normal. The tumor throughout its extent is intimately attached to the duct wall and appears to have started in the tunica propria; there is no thickening of the wall. The attachment of the growth maintains an even line 2 mm. within and along the wall, as indicated to the naked eye by the pigment limit.

The tumor is confined entirely to the common duct and ampulla. Neither the pancreas nor its duct are involved in the growth. There is no similar mass found elsewhere, nor were any cutaneous moles found anywhere on the body. The common duct was opened in situ over a grooved director, to which, on passing it down the lumen, no resistance was offered, so no occlusion was detected by means of the probe. The growth was so soft that only after the duct had been laid open was the obstruction discovered. The brownish black mass now assumed a distinct cylindrical form, which bulged far over the edges of the opened duct. It was only with great difficulty it could be returned to its original place and the edges of the duct brought again into apposition.

At first it seemed as if the tumor was altered blood or inspissated bile; its true nature was discovered, however, after a more careful examination. The melanoma, on closer inspection, showed innumerable densely arranged flattened, finger-like projections; these floated free from one another at their distal extremities, but remained firmly attached at their base. When the mass is submerged in water the upper and lower limitations of the growth are sharply defined. The tumor, with its curious villous structures, resembles certain forms of vegetable algæ growing under water. It is noteworthy that no part of the mass could be washed away or the water discolored by the coloring matter of the tumor. On removing the mass from the water the villi immediately collapsed, allowing the tumor to assume again a smooth, dull, black, velvety surface.

Microscopic examination showed the growth to be composed almost entirely of pigmented cells. The pigment is most marked on the outer extremities of the villi where the alveolar structure

is most pronounced. The cells have a large, distinctly lobulated vesicular nucleus, with one or more nucleoli. The nucleolus is always sharply defined and may be very large, often only a narrow rim of nucleus surrounding an enormous nucleolus. When the cell contains little pigment, it is small and the nucleus proportionately diminished. The pigment invariably occurs in the form of globules arranged in cell protoplasm equidistant from one another.

The pigment differs from that of the melanosarcomata in that instead of the irregularly scattered masses of the latter, it occurs in the form of globules evenly arranged within the cells. The distribution is so regular that it does not seem to be a by-product, but rather an integral part of the cell. An occasional small vessel in the submucosa of the common bile duct in close proximity to the tumor contains pigment cells, and with this exception the melanotic cells are strictly confined to the main mass. There was no metastasis found elsewhere in the body.

The region below the involved part of the duct showed a well-marked periglandular infiltration of lymphoid and plasma cells, but no pigmented cells of any description. All the gland follicles in the tunica propria above and below the growth showed a low grade of chronic peri-inflammation, though other tissues were normal. The villous masses comprising the tumor are covered by a thin though well-defined connective tissue envelope, in whose fibrils are elongated cells arranged end to end in unbroken chain. There was no pigment either intracellular or extracellular in this support tissue, and in no way does it resemble melanoma.

Remarks. The situation of this growth is unusual for a pigmented one, which is apparently primary and whose cellular structure resembles in many ways epithelioma. Secondary melanosarcomata are common in the liver, but no case has been reported of such a secondary growth in the common bile duct. The gall-bladder and ducts are the more frequent sites for primary sarcoma. We must conclude, from the absence of primary growth elsewhere, that the melanotic growth arose from cells in the common bile duct.

There is a possibility that at some time there was dislodgement of one or more pigment-bearing cells from a normal situation which subsequently became arrested at a distant point. In this way we may account for the occurrence of secondary melanoma in an internal organ where no primary tumor actually exists. Of course, this theory is open to the criticism that the primary focus had escaped search.

DISCUSSION.

Dr. William B. Coley, of New York.

I once had a case of melanotic sarcoma in the inguinal region in which the attending physicians said the condition was primary. Careful questioning of the patient revealed no other cause. Upon one foot I observed a thickened area, somewhat darker than the surrounding tissue, apparently callus. The man said that two years before he had sustained an injury to his foot from a nail in his boot. The man died shortly after, and an autopsy showed the foot lesion to be the primary source of the disease. I think in these cases it is quite possible for the primary source of the difficulty to be overlooked.

Dr. Shepherd. I can only say that a most careful examination was made of the whole body by a skilled pathologist, and nothing was found.

SUNKEN NOSE.

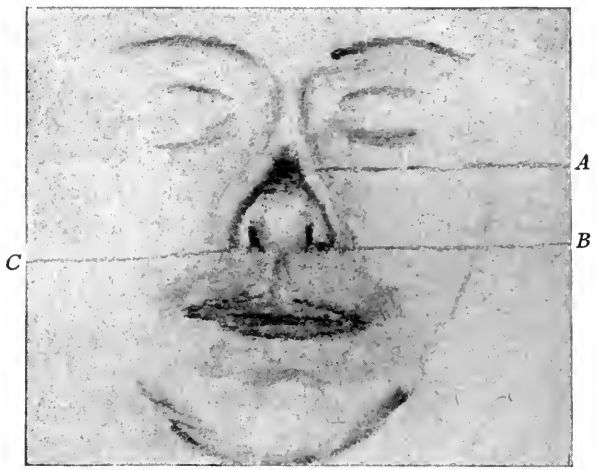
By JOHN F. BINNIE, M.D.,
KANSAS CITY, MO.

INNUMERABLE operations have been devised to correct the deformity caused by destruction of the nasal bones and septum. To this type the term saddle nose ought to be confined. Ch. Nélaton and Ombrèdanne devote a book of 432 large pages to a proper description of rhinoplasty. When, in 1907, a young woman came to me with a distressing deformity (sunken nose, not saddle nose) due to the destruction of the cartilaginous septum, but not of the nasal bones, from infantile syphilis, I consulted the aforementioned excellent work on rhinoplasty with a confidence which was not justified. I found practically everything *except* what was required. The case history is as follows:

Miss N., aged twenty-two years, referred by Dr. Hornbach, Nevada, Mo. Father and mother alive and well. Children older and younger than patient all well. When nine years of age patient suffered from nasal catarrh (?), which destroyed the cartilaginous septum and led to perforation of the palate. Under specific medication the palatal defect closed. Examination, December, 1907: The anterior portion of the nasal septum is absent. The nasal bones are intact, as are also the soft parts. All the unsupported parts of the nose have sunk inward, as if an attempt had been made to suck them into the pyriform opening. This gives the sunken nose a somewhat clover-leaf appearance from in front.

Operation. With a very fine tenotome introduced through the skin all the soft parts attached to the edge of the pyriform opening were divided subcutaneously. This permitted the nose to be pulled forward into fair position. In the middle line immediately

below the bony bridge of the nose a one-eighth inch longitudinal incision was made. Guided by the finger in the nose, a tenotome was passed between the skin and the mucosa from this incision to the base of the ala of the nose on each side. From the lower edge of the thorax two thin strips of costal cartilage were obtained (by von Mangold's method), and were drawn through the subcutaneous tunnels made in the nose. These two strips of cartilage



Median longitudinal puncture is made at *A*. Subcutaneous tunnels made from *A* to *B* and from *A* to *C*.

have remained in place and have converted a *very* distressing into a *much less* distressing deformity. I believe the result may be much improved by introducing a strip of cartilage longitudinally from just above the lower end of the nasal bones down to the tip of the nose (as Freeman introduces a metal strip for saddle nose) and by the insertion of a very thin scale of cartilage under the skin of each ala like a shingle.

DISCUSSION.

Dr. John B. Roberts, of Philadelphia.

I was very much interested in Dr. Binnie's paper, because I recently had a similar case in a young girl who had lost the internal structures of her nose in infancy. I see a great many of these cases, but not many in which the syphilis has occurred so early. She thought my result was very good; I thought it was a pretty fair looking nose, which will need still further operation. I took two large tongue-shaped flaps from her rather fat cheeks and brought them up into the middle line, after having by a transverse incision pulled down the cartilaginous portion of the nose. One of the great difficulties is that when the nose sinks the plane of the nostrils is made nearly vertical instead of horizontal. By a transverse cut I usually pull the whole nose down and forward, so as to get the nostrils horizontal, and then fill in above with tissues of various kinds and shapes from skin of the forehead or the cheek. Dr. Binnie's operation is an interesting method of dealing with cases in which there is plenty of skin.

Dr. C. B. G. De Nancrède, of Ann Arbor, Mich.

I should like to speak of the advantage of Wolfe grafts in these cases. Taking flaps from the forehead or cheek often produces additional scarring of the patient and sometimes only adds to the deformity.

Dr. Leonard Freeman, Denver, Col.

There seems to be two classes of saddle or sunken nose—those in which the skin is loose and those in which there is considerable cicatricial tissue, with a tendency to contraction. In those with the loose skin, paraffin can be used with advantage, or the cartilaginous plates referred to by Dr. Binnie; but in those in which the skin is contracted so that it is necessary to stretch it to put something under it, paraffin does not seem to answer so well. The cartilaginous plates would, perhaps, be too easily bent by subsequent cicatricial contraction to answer the purpose. It seems to me that a metal plate, with one end on the bone above and the other upon the cartilaginous tip, would answer better and prevent the annoying subsequent contraction.

Dr. Emmet Rixford, of San Francisco, Cal.

The successful implantation of strips of costal cartilage into the depressed nose is most interesting. For the construction of the bridge proper, bony tissue of the rib itself may be conveniently used. In the attempted restoration of the nose destroyed by syphilis in a Chinese

patient some years ago, I inserted between the skin flaps a portion of rib, split and bent into suitable form, and from which most of the cancellous tissue had been pared. The bone lived and made a quite satisfactory bridge.

Dr. Frank E. Bunts, of Cleveland.

Referring to the type of operation spoken of by Dr. Freeman, of inserting a thin metallic plate and resting it on the end of the nose, I operated in this way once, using a celluloid plate, very thin, and large enough to raise the nose. The patient was a boy, aged fourteen years. There was great improvement for a time, but ultimately there was infection, and the plate had to be removed.

Dr. Binnie. Although my patient was fairly peaceable, I advised her to avoid scraps.

THE USE OF STERILE OIL TO PREVENT INTRAPERITONEAL ADHESIONS: A CLINICAL AND EXPERIMENTAL STUDY.

By JOHN BAPST BLAKE, M.D.,
BOSTON.
(From the Division of Surgery, Harvard Medical School.)

INTRAPERITONEAL adhesions may be produced (1) by sepsis; (2) by destruction or complete removal of a portion of the peritoneum; (3) by severe or long-continued irritation, even though this irritation be occasioned by a substance originally sterile.

So far as possible, surgeons scrupulously avoid these causes, and, when it is impossible to eliminate them, have endeavored to minimize their undesirable sequels, (*a*) by carefully covering the denuded surfaces by peritoneum, occasionally by omental flaps or grafts; (*b*) by the use of cargile membrane or similar sterile absorbable substances; (*c*) by introducing salt solution, or salt solution and adrenalin, into the peritoneal cavity before closing the incision.

In spite of these efforts, adhesions, which are often a troublesome legacy and not infrequently a dangerous possession, are a common sequel of abdominal surgery.

The object of this inquiry was to determine whether sterile oil possesses qualities which are capable of diminishing these dangers.

I am informed (by Dr. H. A. Lothrop) that Martin, of Berlin, was in the habit, fifteen years ago, of moistening his sponges in oil and rubbing them lightly over the peritoneum and intestines, in certain cases, just before closing the abdominal incision. I have been unable to find any article by Martin referring to this practice, although it is undoubtedly true that his effort was to avoid adhesions.

It has been impossible to discover anything in print upon this

subject, and it seemed desirable, therefore, to ascertain in the first place whether oil introduced into the peritoneal cavity is capable of doing damage. It is the belief of competent histologists that the peritoneum of the cat is in essentials similar to that of man, and its behavior in relation to possible irritants is practically the same as the human peritoneum. If, therefore, considerable quantities of oil introduced into the peritoneum produced undesirable effects upon cats, we might fairly infer that proportionate quantities would produce as bad, if not worse, effects if introduced into the peritoneal cavity of a man. And if in the cat undesirable effects were entirely lacking, it would be a fair inference that in the case of man smaller proportionate amounts of oil would be equally harmless. This first step was deemed essential because in recent years several radical measures have been proposed and utilized in abdominal surgery which previous appropriate animal experimentation would almost certainly have shown to be inefficient or actually dangerous.

The fact that the peritoneum of cats is probably more resistant than that of man to common forms of infection does not affect the validity of this argument, since in all cases the amounts of oil introduced into the animals were far greater proportionately than the amounts which would be necessary to use in human patients; and, similarly, the amount of trauma deliberately inflicted was far greater than would occur in the average abdominal operation.

The hope that oil might diminish the formation of adhesions was based upon the following assumption: Absolutely sterile oil probably remains in the peritoneal cavity for a considerable time; though it presumably collects gradually in the lowest portion of the cavity, it still leaves a thin coating over the peritoneum with which it is brought in contact; being slowly absorbed, this layer stays in position, and tends to diminish the early adhesions which would otherwise occur; these adhesions are favored by the fact that after handling and operative trauma the normal motions of the intestines are diminished; during this early postoperative period oil would naturally be more effective than salt solution in preventing accurate approximation of peritoneal surfaces which necessarily

precedes the formation of the adhesions. If, therefore, oil can be shown to be free from immediate or remote toxic action when introduced into the peritoneum, it seemed probable that it would actually diminish adhesion formation.

Observations were made upon two groups of cats—eight operations on four cats late in 1906, and ten operations on six cats in 1907. Oil has also been used on seven patients.

It was hoped that, whatever the results, the operations upon cats would be final and conclusive, since they could be controlled in a manner impossible in human beings.

Starting with the fact that the peritoneum of the cat is sufficiently like that of man to react similarly to similar irritants, and that it is less easily infected, the first step was to introduce oil into the peritoneal cavities without attempting to produce adhesions. To this maneuver both groups of cats gave identical results. The procedures in 4 cases were as follows: Olive oil (so called) was procured from a grocery store, and sterilized in small, wide-mouthed bottles, being boiled for at least an hour, in an old-fashioned Arnold sterilizer. About 10 c.c. of the sterile oil was injected into the peritoneal cavity of each of two cats—one of the cats was etherized, the abdominal wall shaved and sterilized by scrubbing with soap and water, followed by alcohol; the other cat was not etherized, and the hair of the abdomen was washed with alcohol but not shaved; in both cases the oil was injected from a sterilized antitoxin syringe. (It is probably safer in an experiment of this sort always to etherize the animal.) Neither of these animals showed any effects, either local or general, from this operation. So far as could be observed, they remained in all respects exactly as before.

After an interval of five days, one of these cats was etherized, the abdomen shaved and sterilized and opened in the median line above the umbilicus. Traces of oil were found covering the peritoneum; the presence of oil was demonstrated by touch and by the microscope, and the finding confirmed by Prof. Theobald Smith.

From 1 to 3 drams of sterile oil was now poured into the general

peritoneal cavity and distributed freely over the viscera. The incision was closed in layers with catgut, including peritoneum and transversalis fascia in one layer, and skin and superficial fascia in the other, the wound being covered with sterile absorbent cotton held in place with collodion. The convalescence was uneventful, the wound healing by first intention.

A second cat was etherized March 27, 1907. The abdominal hair was removed with a laboratory preparation of barium and starch (which, after being spread over the hair in a layer about one-sixteenth inch thick and allowed to stay for five minutes, is wiped away with a damp cloth, and the hair goes with it, leaving a smooth, unirritated skin). In this case the abdomen, by mistake, was not cleaned with alcohol after the barium paste, but was simply wiped with water from the faucet.

A median incision was made, 1 ounce of sterile oil poured in until it flowed over the edges of the wound, which was immediately united by catgut in two layers, as usual. This cat was noted to be a little dull and "sick" on the following day (quiet and did not eat), but after that was normal again.

These four operations represented the inquiry, "Does sterile oil in (comparatively) large quantities introduced into the peritoneal cavity, either by subcutaneous or by the open method, do harm either locally to the peritoneum or indirectly to the system in general?" Three of the cats were absolutely normal in the post-operative course; one in which a very large amount of oil was introduced seemed dull for a single day, but no more so than frequently occurs after simple abdominal operations in which oil has not been used. It may, therefore, be concluded that *absolutely sterile* oil introduced in moderate quantities into the peritoneal cavity of cats is not a source of danger to these animals.

Adhesions. It is assumed that if the peritoneum be removed or destroyed and the denuded areas permitted to remain in contact, that adhesions will usually occur, even in the absence of the least demonstrable degree of infection. In practice, however, we must accept the fact that absolute asepsis is not attainable, and that there is a varying but usually slight degree of infection

accompanying every surgical operation. We may, therefore, assume that all adhesions have an element of sepsis in their etiology, though that element may be extremely small; and that some adhesions are due primarily to sepsis and secondarily to trauma, while in others the reverse is true. It is the latter class which has been studied, for two reasons: first, it is difficult to cause in cats sepsis which will produce adhesions and not kill the cat; second, because it seemed desirable to inquire whether trauma accompanied by the least possible sepsis would, as a rule, produce adhesions.

TECHNIQUE. Cats etherized with a small cone; no food for twelve to twenty hours before operation; at the site of operation the hair clipped (occasionally shaved) and the skin washed with soap and water and alcohol; operator's hands scrubbed with soap and water and alcohol; no gloves; sterile single sheet; sterile gauze sponges; instruments boiled five minutes; knives in alcohol; sutures in tubes.

Experiments in relation to adhesions number seven in the recent group and five in the former. The technique was roughly identical in 11 cases, the twelfth being a pyloroplasty after the method of Finney. Median incision above umbilicus; anterior surface of stomach and of that portion of the liver area normally in contact with the anterior abdominal wall, together with the abdominal peritoneum of corresponding area, was scraped vigorously with a scalpel until slight oozing of blood appeared. In one-half of the cases oil was poured directly into the peritoneal cavity, and this was followed by immediate suture in layers without drainage; the other animals were immediately closed after scraping the peritoneum, but no oil was introduced into the cavity.

With a single exception all the animals lived, and seemed as well as before operation. The exception was a cat, which died after three days, having refused food from the first; autopsy showed a generalized peritonitis with a serous exudate in which small whitish flakes were suspended; there were *no adhesions between the peritoneal surfaces*. This cat was, of course, infected at the time of operation. The other cats lived for periods varying from weeks to months, and grew fat and healthy; at the autopsies conditions were found which are summarized in the following conclusions:

1. Under the circumstances described, adhesions may take place along the line of incision and along the denuded areas. Simple scraping of the peritoneal surfaces of adjacent visceral and parietal peritoneum is sometimes insufficient to cause lasting adhesions; usually such adhesions form if oil is not used.

2. Sterile oil does not always prevent the formation of adhesions, after the procedure outlined above. An analysis of these cases does show, however, that there were fewer adhesions, and, as a rule, less extensive and less dense in those cases in which oil was used. In the pyloroplasty, involving necessarily considerable trauma as well as intestinal suture, adhesions were of moderate extent and fairly firm after an interval of twenty-eight days.

There remain observations upon seven patients. Quantities of sterile oil ranging from 1 to 2 drams were either poured directly into the peritoneal cavity or applied on a sponge; five were cases of appendicitis, one a case of extensive adhesions, and one diffuse peritonitis; six were acute, one a secondary operation for symptoms persisting after an operation in which an abscess was opened, but the appendix not removed. Of these, one was done by Dr. H. A. Lothrop, two by Dr. David Cheever, and four by Dr. J. B. Blake. Five had a convalescence which was uneventful; it seemed to me that three of these had less pain and discomfort than might have been expected from the conditions found; certainly the oil did not appear to have the slightest undesirable effect, locally or generally. The diffuse peritonitis died, as was expected, without any obvious effect, good or bad, from the oil. In two cases there were unpleasant symptoms which require consideration. In one case, in the effort to remove a previously inflamed appendix then embedded in adhesions, these adhesions were extensively broken up and the appendix finally removed, almost by morcellation. (The oil was applied on sterile sponges.) For three or four days after this the patient was seriously sick with fever, increased pulse rate, local tenderness, moderate distention, and the signs of an acute local sepsis; there was nothing to indicate fat embolism or any general disorder, save that arising from a local inflammatory focus. Two possibilities present, therefore: either the oil was not

sterile or the adhesions which were broken up covered some gross or microscopic pockets of infection. In either event the oil as such is obviously not the etiological factor. In the second case a delicate woman was operated on the fourth day of a suppurative appendicitis. An almost gangrenous appendix was removed close to the cecum; oil was poured into the wound before the large cigarette drain was introduced. The patient has had a sinus which has never completely healed (three years) and which connects with the bowel; tuberculous peritonitis is suspected; operation is refused; it is not possible that the oil played an etiological role in this case.

The first case suggests, however, the one positive danger of using oil in the peritoneal cavity; it is of course, the danger that accompanies the introduction of anything into that cavity, *i. e.*, the danger of sepsis. Oil is not sterilized by some methods in common use (Theobald Smith); these experiments show that oil may remain in the peritoneal cavity for more than one and perhaps as much as three weeks; the greatest care must be used in sterilizing the oil, therefore, as this seems to be the only danger in its use. It should be boiled for a minimum of an hour.

Conclusions. From these experimental and clinical data it is fair to assume that oil, absolutely sterile, may be used in the peritoneal cavity of patients in moderate quantities (1 to 4 drams) without danger, general or local; that it remains in the peritoneal cavity for periods of from five to fifteen days, and possibly even longer; that its presence tends to prevent early and direct adhesion of denuded or inflamed peritoneal surfaces, and, therefore, that its use, under the above precautions, is indicated and is moderately effective in sometimes preventing and usually diminishing the formation of postoperative peritoneal adhesions.[1]

[1] The experimental part of this study was done in the Laboratory for Surgical Research, Harvard Medical School.

DISCUSSION.

Dr. A. Vander Veer, of Albany, N. Y.

Eleven years ago this subject of oil attracted my attention, and I remember 2 cases in which I made use of it in larger quantity than referred to by Dr. Blake, from 4 to 6 ounces being used, and the patients did well. I believe we have overestimated the amount of peritoneal adhesions following a very large number of abdominal operations. It is true that we do see some very serious cases, but I have made it a special point to observe carefully the condition of the peritoneal cavity when doing a second or even a fourth operation. Within the past three weeks I operated upon a lady who had had three previous operations; one for the removal of a diseased tube, another for the removal of the appendix, about a year following, and a third for fixation of the uterus. I was surprised to find scarcely any adhesions. I have observed in 3 or 4 cases the cecum after operation for appendicitis, but there were no peritoneal adhesions.

The splendid paper of Dr. Murphy especially illustrates the advances in surgery made possible by animal experimentation, and in Dr. Blake's paper we have another illustration from his experiments upon cats. In this connection I should like to say that in the State of New York we have just passed through one of the most unpleasant fights in our State Legislature in regard to vivisection. It would seem that we are approaching very nearly the position that obtains in England today. Should Dr. Blake desire to carry out these experiments in England, he would have to secure permission from one of the officials. In an urgent case causing much delay, we must be on our guard regarding this question of antivivisection.

SURGICAL ASPECTS OF GRAVES' DISEASE WITH REFERENCE TO THE PSYCHIC FACTOR.

By GEORGE W. CRILE, M.D.,
CLEVELAND.

We may accept as proved the fundamental proposition that if a sufficient amount of the thyroid gland in Graves' disease be successfully excised relief or cure will follow. Whether the relief or cure be complete or incomplete is dependent upon the correct or incorrect judgment in estimating the amount of gland tissue to be removed. In my earlier cases I frequently erred on the side of removing too little. The relief that follows the removal of a sufficient amount of gland tissue is comparable to the relief from withholding drugs which cause excitation. The extraordinary subjective relief is expressed largely in psychic terms. It resembles most the phenomena of good news in contrast with bad. Buoyancy supplants gloomy depression. The objective signs of improvement follow later. The psychic and metabolic phenomena are closely interwoven.

The serious barrier to surgical treatment is the immediate operative risk. This risk is not shock, it is not hemorrhage, it is not infection; it is hyperthyroidism. What produces the hyperthyroidism? Operation upon parts of the body other than the thyroid gland in acute Graves' disease is quite as fatal as operation upon the gland itself. Simple accidents occurring in Graves' cases often prove fatal. In acute Graves' disease death may be precipitated by psychic excitation, but psychic excitation cannot be separated from accidents. From the literature, from the general phenomena, from certain experiments, and from the following

specific cases were derived the methods to be hereafter proposed in operation upon these cases.

In the case of a young physician with acute Graves' disease not responding to the best available medical care, an operation was performed. On the day of the operation the hyperthyroidism steadily increased as the hour for operation approached, it was accelerated on his way to the operating room, and culminated in a wild toxic delirium while passing through the first stage of anesthesia. The operation was short and was technically satisfactory. The toxicity, however, was progressive, and he died in the tenth postoperative hour. Temperature at the time of death was 110°.

A young woman with acute Graves' disease became delirious during the preparation for operation under cocaine. The hyperthyroidism rapidly rose, and she died three hours afterward. The temperature at the time of death was 107°, and rose ¾° during the first hour after death.

Another case of acute Graves' disease, during the preparation for operation and during the first stage of anesthesia, became so toxic that no operation whatever was performed. The symptoms of thyroid poisoning were progressive, and she died eight hours later. The temperature at the time of death was 109°, and it rose 1° after death.

These cases appear to be chemically destroyed. They constitute a group of acute cases of the severest types—cases most urgently needing relief. They had resisted medical treatment. They had continuous elevation of temperature, the pulse rate varied from 120° to 160°, the heart was dilated, and all were acutely toxic at the time of operation.

We apparently had not the slightest control over their destiny. During this time we were operating with splendid success on subacute cases of Graves' disease—old colloid goitre with added Graves' disease.

At this time we were fortunate in finding in our laboratories two dogs with unmistakable Graves' disease. They exhibited extreme nervousness, muscular weakness and tremor, a daily range of ele-

vation of temperature, marked gastro-intestinal disturbances, diarrhea, and emaciation. The thyroids gave a distinct thrill, and were large, soft, and vascular. No exophthalmos was noted, but as this is not always a symptom of Graves' disease in the human being, it may not be a necessary symptom in dogs. These dogs, therefore, having tachycardia, temperature curve, loss in weight and muscular strength, and increased appetite and thirst, gave a good picture of Graves' disease. They furnished an unusual opportunity for carrying out a course of experiments. Each dog was observed for several days, to determine as nearly as possible his daily phenomena. The animal was then subjected to various forms of psychic excitation, such as fear and anger. One animal was thrown into a state of marked excitement by fear. When he was frightened, either with a whip or in various other ways, he would show, after about six hours, a marked rise of temperature, increased tachycardia, trembling, gastro-intestinal symptoms, and even diarrhea. The temperature then gradually fell, the mental symptoms subsided, the tachycardia diminished, and the dog returned to his former condition. It was found that anger in the absence of fear also caused toxic symptoms. Following these forms of excitation, the animal exhibited symptoms comparable to those occurring in the human being with Graves' disease. To make the parallel closer, we planned anesthetizing the dog, in the ordinary way, after first exciting him. Following this the dog showed very marked hyperthyroidism. After three days' rest the dog was given morphine half an hour before the anesthetic; the latter was very gently administered, and continued for the same period and under like conditions as in the former experiment. The dog showed no symptoms whatever of hyperthyroidism. In our judgment these experiments were parallel to the different methods of carrying out anesthesia and operation upon human patients with Graves' disease. After repeating these experiments and performing similar ones on normal dogs, until it was obvious that we could produce a state of hyperthyroidism by psychic excitation, we then tried to produce similar symptoms by injecting in various doses the juice of thyroid glands which had been expressed by means of the Buchner press. This

juice was given hypodermically at different times and in varying doses to the two Graves' dogs and to normal dogs, so that, in all, ten dogs were injected. The effect upon the two groups of animals following the injection was very marked. In the dogs with Graves' disease the symptoms appeared earlier and lasted longer and with greater severity than in the normal dogs. In them an injection caused a rise of temperature, appearing after six hours and continuing from three to four days, and in one case ten days. The symptoms in all of the dogs following the injection were those of hyperthyroidism, but they were more marked in the dogs with Graves' disease than in the normal. As a control, the juice from a number of other organs, namely, the kidneys, liver, etc., was administered in twenty times the dosage of that of the thyroid juice, but it was found that it produced no symptoms that could be confused with those of hyperthyroidism. The observations were carefully made, the laboratory was kept open day and night, every two hours observations were taken, and there was little chance for error.

These experiments in the laboratory corroborated clinical observations previously made, and we formed the following hypothesis: that in Graves' disease the most powerful factor producing hyperthyroidism is psychic excitation; that in some way, either directly or indirectly, psychic excitation discharges into the circulation an excessive amount of thyroid secretion, which, in itself, may cause death; that the greatest factor in the mortality is not the operation *per se*, if well done, but what has occurred before the operation. In other words, at the time the surgeon makes his first incision the fate of the patient has been already sealed.

If, then, Graves' disease is surgically curable, and if one of the greatest factors in the surgical risk is psychic excitation, the operation should be performed without the patient's knowledge. Such an operation was accordingly planned and found to be readily accomplished by securing from the patient consent to enter the hospital to be treated either medically or surgically, as I thought best, without further discussion. On entering the hospital a non-operative routine treatment is first employed. The object of this

treatment is that of minimizing the disease phenomena and studying the case. In addition to the routine, consisting of baths, diet, etc., every morning my trained anesthetist, who is gentle and tactful, goes through the complete form of administering anesthesia under the guise of inhalation treatment. On the ether mask are dropped solutions of volatile oils. The patient's friends are told that the date of operation would be determined by the patient's condition. The clinical phenomena in these cases run an uneven course. Within a few days or a week we usually recognize the cycles of the disease. In the optimum portion of this cycle operation is performed. The evening prior to operation the patient is given bromides; in early morning, if the conditions are favorable for operation, a hypodermic of morphine is given. The shades of her room are kept drawn and absolute quiet maintained. In this manner the patient is brought as nearly as possible to a negative psychic state. The operation is done at an early morning hour. At this time the anesthetist repeats the so-called inhalation treatment. The volatile oils are again dropped on the cone and the patient is told that this inhalation will be stronger, and that possibly a sore throat may result, but that the doctors say that this will be the last inhalation required. Gradually the ether is added drop by drop and imperceptibly the patient passes into the second stage of anesthesia. She is then promptly sent to the operating room, and the operation is performed in the usual way. The only change recently made in the technique is that of securing the bloodvessels by means of a long needle threaded with catgut, at the four poles of the gland tissue near the posterior capsule, leaving a portion of the gland. After tying these four ligatures the principal blood supply of the gland is controlled. The gland tissue is then cut away, leaving only portions of each lobe. After this the raw surface is treated with very hot water, almost boiling, to control and destroy the superficial secretion and minimize oozing. The operation is performed with the least possible trauma upon the gland. The results are best appreciated by placing them in contrast with those of other methods and with those following operations for other affections of the gland.

Among 225 operations upon the thyroid gland, 142 were for benign tumors or hypertrophies. Among these there was but one death. Among 28 cases of Graves' disease operated prior to the adoption of the present method the mortality rate was 4. In the 13 cases operated by the new method, all of which were of a fair or a high degree of intelligence, and 9 of which were of the severe toxic type, we succeeded in every instance in performing the operation without the patient's knowledge. The pulse rate prior to and during the anesthesia and operation showed but little change. Sometimes the pulse rose a little, at other times it fell. The usual abrupt circulatory changes attending operations for this disease did not appear. Four of these cases were of the bedridden type, manifesting a running fever, a pulse rate from 120 to 170, acute dilatation of the heart, acute gastro-intestinal disturbances, and violent psychic storms. They were no less severe than the 4 fatal cases previously mentioned. There was the usual postoperative goitre rise in temperature and in pulse rate, but all of the cases made good recoveries.

Summary. There is evidence to show that the thyroid gland may discharge a pathological amount of its secretion in response to psychic excitation. This does not imply an explanation of the etiology. The symptoms of Graves' disease partially or entirely disappear after the removal of a sufficient amount of the thyroid gland. The psychic factor is the most important in the surgical risk. This factor may be eliminated by "stealing" the gland. When eliminated, the operative risk seems to be greatly reduced.

DISCUSSION.

Dr William J. Mayo, Rochester, Minn.

The particular thing, to which I wish to call attention for my brother in this matter, is to endorse the clear statement made by Dr. Crile, and repeated several times in his paper, that there is no question about the surgical cure of so-called Graves' disease, if sufficient of the thyroid gland is removed. The difficulty is to know just how much of the gland should be removed, that the part left may be reduced in size to the exact point, to give the patient the proper internal secretion and not reduce it too much. If too little is removed, a second operation is sometimes required.

The next point is that the pathology of hyperthyroidism is exact. It can be told. A good pathologist can even tell from the physical appearance of the gland on cross-section, without the use of the microscope, the hyperthyroid gland from the ordinary thyroid gland, and from it describe the patient's previous symptoms. There is just the same sort of difference in a general way as between the lactating and non-lactating breast. The term Graves' disease is exceedingly bad; the condition should be called hyperthyroidism. The difficulty has come from the fact that we have not realized that a patient may have a certain degree of hyperthyroidism, with symptoms running over a year or two, and yet not have eye symptoms until late in the disease. Again, we must realize that it may not be a true exophthalmos, but a mere widening of the palpebral fissure, and that said widening will give an appearance of exophthalmos which does not really exist. We have all grades of hyperthyroidism, from the very mild case, that can be cured by medical means, to the later cases, that become extreme. These cases of hyperthyroidism may get well without treatment, and with various sorts of treatment, and it is surprising to find that the percentage of cures has been about the same whether the treatment has been by some form of serum or the old treatment of belladonna. On account of this spontaneous recovery we should not let the cases go beyond a certain limit. The cases that die medically are just as dead as though they had died surgically. You cannot operate upon these cases in a dying condition and expect a good result.

My brother has operated upon about 300 cases of exophthalmic goitre. In the first 16 he lost 4; in the next 30 he lost 3, and in the next 75, but 1.

During the past few months we made a study of the results in 200 consecutive operations for hyperthyroidism. There were 10 deaths, a mortality of 5 per cent. Of 167 letters returned with full report, 70

per cent. were free from symptoms. Those very greatly improved brought the percentage of cured and improved to 84 per cent. There were 10 cases much improved over their former condition, but still with symptoms which brought the percentage of cured, greatly improved, and improved to 94 per cent.; $5\frac{3}{4}$ per cent. were no better than before operation, all having degenerative lesions of other organs, the operation having been done too late.

Dr. Robert G. Le Conte, of Philadelphia.

I have been very much interested in Dr. Crile's paper, for it gives me a logical reason for something I have always believed, namely, that operation in Graves' disease is safer under ether than with a local anesthetic. After witnessing the nervous excitement, struggles, and suffering of these patients under local anesthesia, I long ago concluded that it was more dangerous than the giving of ether. My custom is to partially supply the patient with morphine, $\frac{1}{8}$ gr. hypodermically, then render him rapidly unconscious with ether chloride inhalations when ether is substituted for the ethel chloride. In this way the patient is brought to the operating table with the least possible excitement. In addition the ether seems to slow and steady the heart, so that a pulse rate of 150 or 160 will drop to 120, or even 100.

Dr. Francis J. Shepherd, of Montreal, Canada.

I have had considerable experience in operating upon these cases, and I think Dr. Crile's paper shows a distinct advance in operative procedure. I agree that the psychic factor is a very important element in the disease. I have lost some cases from this cause. They have been excited before operation, and this has continued until death has supervened. In one case the excitement was so great that I declined to operate. The excitement, however, continued, and the patient died. In all these cases of death, with or without operation, I have found great hypertrophy of the thymus gland. I do not know what influence this may have on the condition.

I think that operation under local anesthesia cannot be as good as general anesthesia, because of the excitement produced by the patient's knowledge of what is going on.

PRIMARY CARCINOMA AND SARCOMA OF THE APPENDIX VERMIFORMIS.

WITH A RÉSUMÉ OF ONE HUNDRED AND TWENTY CASES.

By RICHARD H. HARTE, M.D.,
PHILADELPHIA.

PRIMARY carcinoma of the appendix has been a subject which has interested both surgeons and pathologists for many years. A great deal of work has been done on this subject both by pathologists and surgeons, although it has been regarded by many as a very rare condition and by some rather as a surgical curiosity. In looking over the literature, we find that the first case where malignancy of the appendix was recognized was by Merling[39] as far back as 1838. Since that time many cases have been collected, and in analyzing these cases we find that many of those reported are very imperfectly described and cannot be put down as primary cases of carcinoma involving the appendix. Many of them have their origin in the cecum, or else are the result of metastasis from other portions of the infected abdominal viscera. In analyzing the cases it is interesting to note that the majority of those published are reported by American authors. The greater number had some acute or chronic inflammatory lesion which was responsible for the symptoms demanding operation. Some few were found, however, in autopsies as the result of routine examination of the appendix.

As to the frequency of malignant disease of the appendix, nobody can deny that this condition is becoming more commonly recognized as the result of more systematic and careful examination of all appendices removed, as is shown by the number of cases col-

lected and reported from the Bender Laboratory in Albany. There is little doubt that many cases of malignancy were overlooked, in which it was supposed that a macroscopic examination was all that was necessary to demonstrate whether an appendix was slightly inflamed, or whether it was the seat of a neoplasm.

In response to a letter which was sent to the Fellows of this Association, asking for a report of cases of malignant disease of the appendix occurring in their practices, a large number of answers were received, many of the Fellows stating that they had had no experience with this condition. In some of the cases received the diagnosis was not entirely borne out by microscopic examination, and we were therefore forced to exclude them from our list. We were successful, however, in collecting nine cases which had not been previously reported. In 1902 the author reported two cases at the Albany meeting of this Association, in which the diagnosis was verified by a thorough microscopic examination. One of these cases is in perfect health today, but the other patient has been lost sight of. Since that time three other cases have occurred in our practice; in two of them the condition was found as the result of routine operation for appendicitis; in the other, a patient of Dr. Meigs, a neoplasm was found at autopsy, the patient having died of lobar pneumonia at the Pennsylvania Hospital.

We have collected from various sources 111 cases of primary carcinoma of the appendix; to this number may be added 9 cases collected by the author, the most of which have occurred in the practices of the Fellows of this Association. It will, therefore, very readily be seen that the condition ceases to be a rarity.

Zaaijer[64] mentions that 18 cases of carcinoma were collected from a total of 2322 autopsies for appendicitis; we think it probable, however, that this number is too small, as in many of these 2322 cases the appendices were not examined microscopically. If this procedure is not carefully carried out, many cases will be lost; in one of our own cases the detection of malignancy was recognized only after several sections had been cut through different portions of the appendix.

Baldauf[1] states that about 1 per cent. of all inflamed appendices

removed will be found to be malignant to a more or less degree. This malignancy depends for its severity in a great measure upon the time of life in which it is detected. For instance, carcinomas of the so-called basal-celled variety, as described by Warthin,[59] arising in young subjects, seem to be much less malignant. Baldauf's percentage appears large when compared with the results of older observers, but this difference is attributed by some to the more accurate methods of examination now being employed. Kelly[28] explains it by the fact that carcinoma of the appendix often causes perforation or gangrenous inflammation in its early stages. But there appears to be another factor at work: If appendicitis is the cause of appendical carcinoma, an increase in the former will cause an increase in the latter, and *vice versa*. An increase in the frequency of carcinoma of the appendix will be an important argument in favor of assuming an increase in appendicitis.

The question of carcinoma of the appendix must be investigated from both an anatomical and a clinical side. We find that in nearly all the collected cases the operation was performed for the relief of symptoms of appendicitis of either an acute or chronic variety. The condition of the appendix was found on careful microscopic examination. In many instances the inflammation had lasted for a period of years, and in some instances it would seem that the inflammation antedated the cancer. A point worthy of attention is that few cases of carcinoma of the appendix have occurred where there was an acute inflammation, but when this has occurred it has in all probability been an acute attack grafted on an old case of chronic inflammation of the appendix. That chronic inflammation plays a very important part in carcinoma of the appendix is shown by the fact that a large percentage of the tumors were found in the tip of the appendix, which had previously been obliterated by chronic inflammation. Some tumors were detected throughout the organ, and a few were found in a totally obliterated appendix.

These facts, therefore, go far to prove that this neoplasm has a strong predilection for developing in the seat of a previously chronically inflamed appendix.

The age of the patient in which we find appendical carcinoma is of no little interest. If we tabulate those cases in our list, we have:

Under 10 years of age	5
From 10 to 20 years of age	18
From 20 to 30 years of age	42
From 30 to 40 years of age	28
From 40 to 50 years of age	11
From 50 to 60 years of age	4
From 60 to 70 years of age	4
From 70 to 80 years of age	2
From 80 to 90 years of age	1
Age not stated	5
Total	120

(Average age of all cases was thirty-one years.)

Of this number, 44 were males, 66 were females, and in 10 the sex was not stated. Age not mentioned in 5 cases.

We have also been able to collect 6 cases of sarcoma of the appendix, of which 4 were males and 2 females. The respective ages of these patients were forty-five, thirty-nine, twenty-seven, fifty-five, and in 2 cases the age was not stated.

The question may naturally arise, Why does the age of malignancy in the appendix differ so greatly from the age at which malignant disease is found in other organs of the body? But this can be answered by the fact that a large percentage of all carcinomatous appendices are found as a result of operations for appendicitis, and most operations of this character are done between the ages of ten and forty years. Therefore, the above deduction cannot be said to be true, but is simply applicable to the usual age at which operations for appendicitis are performed.

The tumors, although almost always very small, vary greatly in size—from microscopic size to the size of a normal ovary. As we know little about the early stages of intestinal cancers, it may be that similar cancers can be found in other parts of the intestines in young individuals; if so, they are usually overlooked at autopsies, and we might therefore say that very small cancers of the appendix

make their appearance from ten to thirty years earlier than the large evident intestinal tumors presenting clinical symptoms.

The appendical tumors will generally give rise to symptoms apart from those accompanying appendicitis only when the growth has extended to the surrounding tissues, invading the cecum and becoming a carcinoma of this organ, for by this time the appendix has lost nearly all its characteristics and is hardly recognizable as the primary seat of the growth. We are of the opinion that these cecal cancers originating in the appendix are apt to occur later in life, usually between forty and sixty years, and have a marked tendency to metastasis and recurrence. Many writers concede the appendical origin of cecal cancers, believing them to spring from some cancer nest in an old, chronically inflamed appendix, after the patient has reached the age of forty to sixty years. So obscure is this subject that light can be thrown upon it only by the fundamental revision of cecal carcinomas, and by the careful study of all future cases.

Our experience with recurrence of the disease in the cecum after removal of the appendix for carcinoma has been very limited, but there is no doubt that in a certain number of cases the condition does recur in the cecum.

It would seem probable that the cases of primary malignancy of the appendix so far reported fall into two classes: first, the columnar-cell type, as found in the stomach, intestine, and other parts of the alimentary tract; and second, the spheroidal-cell type which closely resembles the basal-cell carcinoma of the skin. In this latter class Rolleston and Jones[52] would place the great majority of primary cases of appendical carcinoma, and we think it probable that many cases described as endothelioma and sarcoma are in reality this type of carcinoma. Warthin is of the opinion that the vast majority of reported cases of malignant tumors of the appendix are to be classed as basal-cell carcinoma. This theory seems also to be borne out by the age incident: the average age of 14 cases described as spheroidal-cell carcinomas was twenty-four years, while the average age of the cases described as columnar-cell carcinomas was about fifty years, which more nearly corresponds

to the average age at which primary carcinoma of the intestine occurs. We may therefore consider that basal-cell carcinoma of the appendix is a disease occurring in early adult life, the earliest observed case being about seven years of age, reported by Oberndorfer.[45] The basal-cell type is characterized by its relatively slight malignancy, and it does not tend to set up metastases or to recur after operation. In case of columnar-cell type the prognosis is not favorable. This fact is only another evidence of the importance of basing the ultimate diagnosis and prognosis upon the precise histological study of the neoplasm.

Rolleston and Jones in a number of cases removed the appendix during life, but the nature of the disease had not been suspected in any case prior to operation. In three of their cases a portion of the cecum at the base of the appendix was removed, and in two cases a more radical operation was necessary. Recovery is definitely stated to have occurred in the majority of the cases.

Zaaijer[64] believes that the difference in the age at which the principal types of carcinoma occur in the appendix is so small that one cannot say that any one type of carcinoma is more apt to occur at any stated age than is another type, but we think an exception may be taken to this statement in the occurrence of the so-called basal-cell type, which, as has already been stated, has been found most frequently in young subjects.

The principal mass of the tumor is generally to be found located in the mucosa and the submucosa, and in the central connective tissues which replace these layers in obliterative appendicitis.

After a careful consideration of the collected cases, we agree with Ribbert's[49] theory regarding the histogenesis of carcinoma of the appendix, *e. g.*, that the tumors develop from epithelial nests which have been loosened from their attachments and which find the chief cause of their detachment in the chronic connective tissue inflammation. It is difficult to determine the starting point of many of these small tumors, but it would appear that the disease starts in the mucosa, which becomes replaced by spheroidal-cell growths from the Lieberkühn crypts.

After having considered in a measure some of the clinical and

pathological signs of cancer of the appendix, are we able to build any hypothesis which will assist us in making a positive diagnosis of cancer of the appendix via other than the classical signs of appendicitis, such as pain, with which it is so closely associated? Let us, therefore, consider the classical signs of appendicitis, namely, pain, tenderness, presence or absence of a mass, rigidity, temperature, pulse, blood, history of previous attacks, age, sex, and the question of heredity.

Pain in the region of the appendix is so common in all intraperitoneal irregularities that no dependence can be placed upon this system beyond indicating an inflamed appendix.

Tenderness and pain go hand-in-hand so often in all forms of appendicitis that it is of little diagnostic value.

The *presence of a mass* can be determined only if the disease has invaded the cecum, and often from this sign, in the absence of any acute inflammatory action, the diagnosis of malignancy can be made. In one of my cases, however, the appendical tumor was as large as an ovary, and yet nothing could be palpated, simply because the neoplasm was floating loosely, attached to a long appendix and meso-appendix. The author feels very skeptical with regard to the asserted ability of some surgeons to palpate appendices which, on opening the abdomen, were only located after a long and diligent search.

Rigidity will be noticed only in proportion to the amount of pain that is experienced or irritation caused, especially when the abdomen is palpated, and this rigidity is simply an attempt on the part of the muscles to protect the inflamed and irritated appendix from injury. It is always seen where there is any intraperitoneal irritation, arising from any source.

Temperature. It is questionable if any deductions other than an inflammatory condition can be drawn from this symptom. Moschcowitz mentions a curious temperature rise in one of his cases, but this appeared to be dependent upon some auto-intoxication entirely foreign to the appendix.

Pulse. It would be impossible to expect to draw any deductions from this source beyond a distinct rise in the temperature or an acute inflammatory condition.

Blood. If the disease in question has advanced and is causing much local irritation, a distinct leukocytosis might be expected. On the other hand, in microscopic cases I question if any data can be gathered from the most elaborate study of the blood picture.

The *history of previous attacks* is important, bearing considerable relation to both the symptoms and the prognosis. It appears that nearly, if not all, cases of cancer of the appendix have been ushered in by attacks which were supposed to have been appendical, but it is only after the removal of the appendix that the exact condition reveals itself. It generally shows that the carcinoma has selected for its site a previously chronically inflamed appendix. This view has been strengthened by the observations of Letulle and Weinberg, and was undoubtedly true in the four cases upon which the author has operated. Patients are apt to be so inaccurate in their statements with regard to former attacks of appendicitis, confusing the symptoms with those of cold, indigestion, or slight abdominal cramp, that deductions placed upon such information are of practically no value. Moschcowitz, in analyzing a number of cases, states that 66 per cent. of carcinomas were preceded by acute inflammatory symptoms. The symptoms in some few cases may be caused by a small neoplasm impinging on the lumen of the appendix, causing a stenosis which will cause symptoms of appendicitis. I am strongly of the opinion that in the appendix, as in other portions of the body, malignancy tends to develop in previously chronically inflamed and irritated areas, and consider this a strong argument for the removal of all offending or troublesome appendices.

The question of the *age of the patient* has already been spoken of at some length. Most of the collected cases of carcinoma of the appendix have been procured from operative statistics, the operations being, as a rule, performed on patients between the ages of five and forty years. The natural conclusion, therefore, would be that carcinoma develops in appendices most frequently at the time of life in which the acute inflammation of the appendix is most common, but this is simply because the condition is disclosed at operation.

The sex of the patients noted in the appended table was given in 100 instances; of these, 41 were males and 59 females. The anatomical relations in both sexes are identical, with the exception of an occasional appendiculo-ovarian ligament. Nevertheless, the greater frequency of the condition in the female is worthy of note.

In cancerous diseases, *heredity* is a factor which must not be lost sight of, especially where the examination of a patient who has passed into the cancer zone is concerned. The author's last patient operated upon was forty-one years of age, and at the time of his operation his mother was suffering from an advanced scirrhus of the breast, from which she subsequently died.

After carefully considering the various signs, symptoms, and pathological data relative to primary cancer of the appendix, we arrive at the following conclusions:

1. Primary carcinoma of the appendix is present in from $\frac{1}{3}$ of 1 per cent. to 1 per cent. of all cases operated upon for chronic appendicitis. But few cases are collected at autopsy.

2. Institutions which make a thorough microscopic examination of all appendices removed at operation and at autopsy will report a larger percentage of cases of carcinoma of the appendix.

3. Carcinoma of the appendix, especially of the basal- or spheroidal-cell type, is a condition of early life, occurring generally between the ages of ten and forty years. There is little tendency to metastasis, and the origin of the disease is, as a rule, in the mucosa.

4. The disease appears to be slightly more frequent in females than in males.

5. Acute and chronic inflammations are present and are responsible for the symptoms demanding operation. The growth, while localized, gives no pathognomonic symptoms.

6. The fact that primary carcinoma of the appendix takes its origin in an inflammatory process forms a very strong argument for the removal of all appendices which show evidence of any irritation.

The histories of the unreported cases which the author has been able to collect are as follows:

CASE I.—G., man, aged thirty years. Carcinoma of the appendix was discovered at autopsy after death from lobar pneumonia. Patient of Dr. Arthur V. Meigs at the Pennsylvania Hospital. Admitted January 21, 1904. Died January 23, 1904. Family history negative. Had rheumatic fever at thirteen, and has had quinsy several times and pleurodynia once. Caught cold on the 17th ult. and developed typical attack of pneumonia. Physical examination on admission negative, except as to pulmonary condition. Patient was wildly delirious before death. Temperature averaged 104° F. There were no symptoms pointing toward the appendical condition.

Autopsy No. 513. Ayer Clinical Laboratory. Anatomical diagnosis: Acute lobar pneumonia, double acute fibrinopurulent pleurisy, fibrinopurulent pericarditis, congestion and edema of the lungs, acute splenic tumor, cloudy swelling of kidneys and liver, primary adenocarcinoma of appendix. There were no evidences of metastasis. The appendix measures 6 cm. in length and lies behind the cecum, pointing downward. There are no adhesions. The appendix ends in a bulbous, whitish tip, which curls around much as a snail shell, and is slightly adherent to itself at the distal part only. This bulbous end measures about 2 cm. in diameter. The thickening and enlargement occur very suddenly, and measure about 5 cm. in length. The curled tip shows many injected vessels over its surface and a few minute, pinhead-sized nodules.

On section through the curled tip, what represents the lumen appears as a solid, round, regular, well-defined mass, 7 mm. in diameter. It is streaked yellow and gray and bulges considerably.

Microscopic Examination. Sections through the bulbous tip: The entire central portion of the appendix is filled with an adenomatous growth. The gland spaces are separated by delicate connective tissue trabeculæ. Some of the spaces are lined by one or several layers of columnar or cuboidal epithelium, usually separated from the wall. Others are almost filled with loose epithelial cells. Surrounding this are the muscular tissues, which are

infiltrated with narrow strands and groups of cells like those in the mucosæ.

CASE II.—Personal communication from Dr. C. H. Monks. X. Y., aged twenty-four years, a strong, well-built woman, who had previously been troubled more or less with indigestion for an indefinite period, entered the Boston City Hospital in September, 1902, with symptoms of appendicitis, from which she had suffered for two days. This illness began with pain, which was more or less general over the abdomen, later becoming limited to the lower half. No vomiting, and bowels were easily controlled with enemata. The general condition of the patient on admission was good, and pain was not severe. Temperature, 100.5°; pulse, 100. No spasm of abdominal muscles; moderate tenderness in region just below and to the right of umbilicus and also in corresponding region in left side. The diagnosis of chronic appendicitis was made, and the appendix was removed a few days later and externally presented the appearance of chronic inflammation.

Pathological Examination. Appendix 5 cm. long. Mesentery adherent, with some fat. Surface reddened. Small dilated blood-vessels easily seen. Mucous membrane grayish and gelatinous. Yellowish nodule 0.6 cm. in diameter found 1.5 cm. from distal end.

Microscopic Examination. Slight infiltration of muscularis under submucosa, with lymphoid cells. At site of tumor the mucosa is entirely replaced by a mass composed of connective tissue surrounding collections of epithelial cells.

Diagnosis. Adenocarcinoma; chronic appendicitis.

The patient made an uneventful recovery from the operation, and was discharged twenty-four days later.

Five and one-half years after the operation the patient was thoroughly examined and no evidence whatever of recurrence was seen, and she was enjoying the best of health.

CASE III.—Personal communication from Dr. John C. Munro. J. F. F., aged forty-seven years; Irish laborer. Admitted April 3, 1906. Discharged April 30, 1906. Family history negative.

Previous History. Two weeks before operation he had an acute attack of general abdominal pain, localizing in appendical region,

and accompanied by nausea and vomiting. Pain and tenderness subsided gradually in three days, but there has been an exacerbation of these symptoms about every other day since attack began. Lost seven pounds and had no appetite.

Physical Examination. Well developed and nourished; has nonmovable mass the size of a tennis ball in right iliac region; there is tenderness but no spasm.

Operation. Operation by Dr. Bottomley, April 4. Rectus incision, rather higher than usual, over mass. Very hard irregular mass to outer side of cecum, to which it was slightly adherent. Appendix removed by peeling out mucous and submucous coats. That the tumor was malignant was not realized until the pathological report was received a few days later. Cigarette drain placed and wound partly closed, as there was some oozing. There was a purulent discharge for a few days, but recovery was uneventful.

Microscopic examination of the appendix shows it to be infiltrated with carcinoma of a cylindrical-cell type.

A secondary operation was urged as soon as the nature of the lesion was known, but patient refused. Patient was examined March, 1908, and no evidence of metastasis could be found. Patient seemed in perfect health.

CASE IV.—Personal communication from Dr. A. T. Cabot. Miss P., aged thirty years. Operation, 1907. Had symptoms referable to appendix, and operation for removal showed appendix to be twisted.

Microscopic Examination. The specimen consists of a very much curled-up appendix, bound down by adhesions. The epithelium of the glands of the mucosa has undergone a very curious atypical growth, which in places presents the histological picture of a carcinoma, but lacks the infiltrating character of such a growth. There is a large amount of chronic inflammatory tissue present.

This operation was not followed by as complete a recovery to comfort as was to have been expected, and when this condition described by Dr. Wright was known, I remembered that I felt a little nodule down, seemingly, on the wall of the pelvis, which at

the appendix operation I could not bring into view, and which I thought was simply a little fibroid. On January 14, 1898, I again operated. At that time the patient was in better weight, and had been having better digestion; looked distinctly better than when I had seen her in May. Examination under ether showed the right ovary fixed on the side of the pelvis and enlarged, although not greatly so. Upon opening the abdomen, I found the ovary as it had been felt by examination, and close above it was a little hard mass which was situated in the side of the Fallopian tube. The ovary and the whole Fallopian tube were ligated and cut away. The other ovary seemed in good condition, and the uterus was in good position, so that it was not fixed by suspension. The Fallopian tube presented a pea-sized nodule in its wall. This nodule is due to the presence of carcinomatous tissue in the wall of the tube, as demonstrated by microscopic examination. The patient was heard from in 1907, when she still had considerable pelvic distress, and a second operation for removal of other ovary, etc. At this time the organ removed showed no sign of carcinoma.

A reëxamination of the sections of the appendix by Dr. J. H. Wright, in the case of Miss P., convinced him that the condition in the organ is carcinoma. The carcinomatous tissue consists of large and small columns and masses of atypical epithelium-like cells embedded in a variable amount of connective tissue stroma. The cells are generally smaller than the general run of carcinoma cells, and do not form tubules, as is commonly the case in cancers of the intestine. In a few places there are appearances suggesting the origin of the carcinoma cell masses from the dilated tubules of the mucosa. The tumor tissue does not appear to infiltrate the outer layers of the muscular coat of the appendix.

A reëxamination of the sections from the Fallopian tube, reported under the date of January 15, 1898, shows a carcinoma in the wall of the tube. There is no involvement of the mucous membrane. The carcinoma shows, generally, narrow columns of epithelial-like cells embedded in a moderate amount of stroma. The cells in general are larger than the cells of the carcinoma of the appendix. There is nothing, however, inconsistent with the idea that this

carcinoma of the Fallopian tube may be a metastasis from the carcinoma of the appendix.

CASE V.—Personal communication from Dr. A. Vander Veer. Report from the Bender Laboratory of the Albany Hospital. Miss M. A., aged fourteen years.

Clinical Diagnosis. Acute appendicitis. Operation by Dr. Sibley. Specimen consists of a swollen and previously sectioned appendix measuring 6.5 cm. in length. The external surface is covered in places by an exudate of rather adherent, yellowish white material. All coats are thickened. Mucosa presents numerous punctate hemorrhages and is ulcerated in patches; 2 cm. from the proximal end there is a slight thickening of the tissues, particularly of the mucosa.

Anatomical Diagnosis. Acute diffuse and ulcerative appendicitis. Acute fibrinopurulent peri-appendicitis.

Microscopic Description. On section, all coats are thickened and infiltrated by polynuclear leukocytes. Exudation of lymph on peritoneal surface. Mucosa ulcerated in patches. Other sections show all coats to be invaded by irregularly branching and anastomosing columns of polyhedral cells.

Micoscopic Diagnosis. Carcinoma simplex of appendix. Acute diffuse and ulcerative appendicitis. Acute fibrinopurulent peri-appendicitis. Patient was in good health three years after operation.

CASE VI.—Personal communication from Dr. A. Vander Veer. Report from Bender Laboratory of the Albany Hospital. Miss W. P., aged thirteen years.

Clinical Diagnosis. Appendicitis. Operation by Dr. Hacker. Specimen consists of a markedly thickened appendix, firmer than normal, and measuring 4 cm. in length. The peritoneal surface is pinkish red, has firm fibrous tags attached, and 1 cm. from the tip presents a small perforation which communicates with the lumen; the tissues about this opening are greenish black. The lumen is patent throughout. The mucosa is pinkish gray, shows numerous spots of ecchymosis, and is everywhere thickened. Accompanying the specimen is a strip of omentum 8 cm. in length,

which shows at one end a fibrinopurulent exudate. It is deep red and has fibrous tags attached.

Anatomical Diagnosis. Chronic appendicitis, with acute exacerbation, gangrene, and perforation.

Microscopic Description. Section shows the mucosa to be atrophied and in some places entirely absent. The stroma about the gland follicles shows eosinophilic infiltration. The lymph follicles are enlarged and show young connective tissue infiltration. At one side of the section in the submucosa is an area containing but little connective tissue stroma, showing numerous clefts filled with masses of large cells with deeply staining nuclei and having no definite arrangement.

Microscopic Diagnosis. Carcinoma of appendix. Chronic appendicitis, with acute exacerbation and necrosis.

CASE VII.—Personal communication from Dr. A. Vander Veer. Report from Bender Laboratory of the Albany Hospital. Miss K. B., aged twenty-one years. Clinical diagnosis was chronic appendicitis.

Specimen consists of a previously sectioned appendix. Distal two-thirds considerably thickened. The peritoneal surface shows numerous dilated bloodvessels, and at the distal extremity firm red tags. At the junction of the middle and proximal thirds the lumen is obliterated and the distal end is considerably thickened and filled with a greenish fecal mass. The mucous membrane of the distal two-thirds is grayish red, showing spots of hemorrhage. The remainder of the mucosa is apparently normal.

Microscopic Description. Sections of appendix show mucous membrane diminished in amount and crowded together, the lumen being obliterated. There is an increase of connective tissue in the submucosa and there are numerous newly formed bloodvessels. The muscular coat shows a moderate, small lymphocyte infiltration, and the peritoneum is edematous and has irregular tags of delicate, edematous tissue interrupting its free surface. In the submucosa there is a growth composed of areas of cells with large, deeply staining, vesicular nuclei, separated by strands of connective tissue and arranged in alveolar form. The connective

tissue surrounding this newgrowth is deeply infiltrated with small round cells. The newgrowth is more or less circumscribed and pushes aside a portion of the mucous membrane.

Microscopic Diagnosis. Chronic obliterative appendicitis. Primary carcinoma of the appendix.

CASE VIII.—Harte. Admitted to Pennsylvania Hospital October 17, 1907; discharged November 7, 1907. G. P., man, aged forty-one years. Came to the hospital complaining of slight dull pain, soreness, and some tenderness in right iliac region for the past three months. Mother operated upon for carcinoma of the breast two months ago. History otherwise negative. Always robust and healthy except for appendical trouble and an attack of typhoid fever at fifteen. No venereal history.

Present illness dates back about two years, when he had abdominal pain and tenderness, vomited, and was slightly constipated; was compelled to go to bed for a day or two. The following week had another attack, and subsequently had slight attacks of abdominal pain and discomfort lasting two to three days, every month, for three or four years; attacks then decreased in frequency up to about four months ago, when they recurred with increased severity, and pain and tenderness in right iliac fossa became more pronounced, and he had some slight nausea and constipation. Appetite good. Condition remained about the same until his operation.

Physical Examination. Well-built man; heart, lungs, and urine negative. Abdomen negative.

Operation (Dr. Harte). Incision in right rectus. Mass 4 by 8 cm. in size found lying free in right iliac fossa and continuous with appendix. It was very much like a swollen testicle. Mass removed and appendical stump inverted in the usual manner. Incision closed in layers and supported with through-and-through silkworm-gut sutures. Uninterrupted convalescence. Wound healed nicely.

Pathological Examination. The specimen consists of a large, more or less egg-shaped cyst, which measures approximately 6 or 7 cm. in length, and appears as large as a hen's egg. The cyst has been opened, but the contents are still adherent to the wall.

It is a soft, sticky, jelly-like material, part of which is opaque and yellowish green, parts seem translucent and dark yellow in color. Here and there are small masses of blood.

Altogether the contents of the cyst measures at least 100 c.c. The outside of the cyst is quite irregular in appearance. It is generally of a pinkish color, and shows many injected vessels. Over all parts of the external surface there are irregular white thickened patches 0.5 to 2 cm. in diameter, which are quite firm and definitely raised. The margins are quite well outlined. Some of them extend down toward a line of fat, which is taken to be the meso-appendix, and which extends throughout the cyst along one surface. This meso-appendix is rather small.

At the proximal end of the cyst there is a narrow stump, which looks like the appendix. This measures about 0.5 cm. in length and a little over 0.5 cm. in diameter. The wall of this small bit of appendix is continuous with the wall of the cyst, though the appendix begins very suddenly. The stump of the appendix as well as the cyst has been opened.

Only a few millimeters at the extreme proximal portion suggest in the least a normal appendix. Here the lumen seems to be lined with a soft mucous membrane. The area between this and the cyst is filled with a fairly firm, opaque, yellow material, which apparently has occluded the appendix.

The incision which was made in the operating room continues through the mass, which was cut in two, and into the cyst. It cannot be told now whether there was communication between the cavity of the cyst and the lumen of the proximal end of the appendix. The wall of the cyst, where the gelatinous material has been removed, appears very irregular and has a lumpy appearance. It is lined by what looks to be a thin, yellowish, parchment-like membrane. In places the yellow-like material is quite firmly attached to the wall.

When some of the nodules on the serous surface are cut into they seem to be of an opaque, firm, yellow material.

Sections through the proximal end of the appendix show the following appearance: The subserous coat looks somewhat con-

gested, thickened, and contains fairly large accumulations of small round cells. The muscular walls are thick and the inner circular coat is two or three times the thickness of the outer longitudinal coat. Besides the thickening, there is much degeneration in the muscular coats. The fibers are swollen, hyaline, and separated by a great deal of loose connective tissue. In the submucosa, which is rather thin, there are localized accumulations of small round cells, often with centres composed of large pale cells. These are taken to be the remains of lymphoid follicles. There is an increase in the connective tissue in the submucosa. The normal mucosa is entirely lost. In its place there is a thin layer of what appears to be hyaline fibers, separated by a few connective tissue cells. On the surface of this hyaline material there are very curious cells. These are large irregular cells, sometimes elongated or goblet-shaped, and projecting toward the lumen of the appendix. Many of them are filled with refractal granules. They are of a great variety of shapes and sizes. Many of them contain two nuclei; some appear as giant cells containing four to twenty nuclei or more. The nuclei are rather small, elongated, and deeply staining. Covering these cells is a layer of hyaline-looking material, which contains cell remnants and red blood corpuscles; near the lining cells this material stains blue in hematoxylin; toward the centre it stains pink in eosin. This material corresponds to the jelly-like contents of the cyst. The small nodules between the proximal portion of the appendix and the neck of the cyst show in two sections different appearances.

In one section the nodule is composed of connective tissue infiltrated with small round cells, cells of epithelioid and plasma-cell type, and shows spaces, particularly near the surface, containing the hyaline material. Covering the surface of this nodule there is an irregular fringe of large cells, described before. Great numbers of very large giant cells are seen, and mixed with them are the elongated and columnal cells of epithelial type. This large cell gradually mixes with the blue-staining cyst contents.

Sections through another nodule show a definite carcinoma simplex. The cells are rather small, irregularly polygonal; have

deeply staining nuclei, and lie closely packed in spaces of various sizes. Some of the spaces are quite large, but there are rarely degenerative changes in the centre. No definite karyokinetic figures are seen. The masses of cells infiltrate rather extensively the underlying muscular coats and in the nodules are separated by a moderate amount of connective tissue.

Sections through the wall of the cyst show much the same appearance as sections through the wall of the proximal part of the appendix.

The muscular coats are more irregular, sometimes being thick, sometimes thin, and the accumulations of small round cells in the tissue above the muscular coats is more extensive and more diffuse. The lining membrane is practically the same and shows great numbers of giant cells. Sections through the hard masses in the cyst wall show them to be composed of old hyaline connective tissue.

Anatomical Diagnosis. Carcinoma of the appendix. Cyst formation, with muciginous contents.

CASE IX (Harte).—M. K., woman, aged thirty-nine years. Admitted February 19, 1903. Discharged March 30, 1903.

Previous History. Patient has been sick three days with severe pain and tenderness in right iliac region; bowels have not moved for four days; no vomiting and no fever. Has never had similar attack before, but has had three attacks of gastritis.

On admission, temperature, 102.2°; abdomen fat; distinct rigidity of right rectus, with marked tenderness in right iliac region, where there is also increased resistance. Urine: Very faint trace of albumin and a few hyaline casts; otherwise negative.

Operation (Dr. Harte). Under ether an incision was made in right iliac region, and appendix was found to be thickened, inflamed, and very rigid, being practically broken off about 1 cm. from its base. Slight adhesions, no pus. Stump of appendix was ligated and excised. Wick of iodoform gauze carried down to bottom of cavity and wound partly closed. Slight fecal discharge, which lasted a short time, but closed before the patient left the hospital. On discharge there could be felt an irregular, hard mass in region of the wound.

Pathological Diagnosis. Primary carcinoma of the appendix. Specimen consists of a small piece of fat and connective tissue about the size of a hickory nut, in the centre of which there is some gray necrotic material. On section the lumen of the appendix is found embedded in the mass. The mucosa is swollen and red.

Microscopic Examination. The appendix is the seat of the most extensive changes. No coats but the external muscular can be made out. Everywhere there is extensive infiltration of polymorphonuclear leukocytes and the production of new connective tissue. The lumen is filled with leukocytes and desquamated epithelial cells. Glands are found only in what remains of the mucosæ in one or two sections; they extend from the surface, where here and there the remains of superficial epithelium can be seen, down deep into the appendix wall. They form long irregular ducts or spaces, lined sometimes by several layers of cuboidal or polygonal epithelium, and sometimes completely filled by such epithelium; often the layers of cells are detached from the wall of the space. These irregular ducts and spaces extend into the muscular coat. The stroma of the mucosa and submucosa is entirely destroyed or altered, so that the coats are formed of granulation tissue densely infiltrated with polymorphonuclear leukocytes and small round cells. This acute inflammation extends about the appendix into the mesentery and fatty tissues. The growth of ducts and alveoli becomes more irregular and atypical the farther they are removed from the lumen of the appendix. They extend into the mesentery and invade the granulation tissue of the region. Sometimes distinct atypical gland-like arrangements exist. The cells forming the invading tumor are very irregular, polygonal, and have variously shaped vesicular nuclei. In the sections where the growth in the mesentery is larger, the gland-like arrangement is very well marked. Sometimes the centre of the gland-like spaces is filled with blood cells.

Patient has been lost sight of.

The following cases have been collected from the literature:

CASE I (Rokitansky[50]) (1847) (from Elting).—Autopsy on individual aged eighty-two years, who died of pulmonary disease.

The appendix was transformed into a sac 6 inches in length and 2 inches in diameter, and was adherent to the posterior side of the cecum. The walls of the appendix appeared fibrous in character and the cecal orifice of the appendix was obliterated and the sac thus formed contained a yellowish white, gelatinous material.

CASE II (Rokitansky[50]) (1854).—Individual, aged sixty-eight years, who died of pneumonia. The appendix was 2 inches in length and the distal two-thirds was transformed into a spindle-shaped fibrous sac about the size of a pigeon's egg, which contained a yellowish gelatinous material traversed by fine reticulated processes which took their origin from the wall of the sac.

CASE III (Rokitansky[50]) (1866).—An individual, aged seventy years, who died of heart disease. The appendix was 4 inches in length and the distal 2.9 inches was transformed into a sac distended with a gray gelatinous material. This portion of the appendix was about 1 inch in diameter and the wall was of a fibrous character; from it numerous delicate processes ran in different directions through the gelatinous contents.

CASE IV (Rokitansky[50]) (1866).—An individual, aged thirty-eight years, who died of pulmonary and intestinal tuberculosis. The appendix was 1.9 inches in length and consisted of two compartments. The distal, lined by a smooth mucosa, contained a grayish gelatinous material, while the proximal compartment was distended with a gelatinous material traversed by numerous delicate strands of tissue, which appeared to originate from the fibrous wall of the compartment.

There is some doubt as to the carcinomatous nature of these cases of Rokitansky, as no mention is made of the microscopic structure.

CASE V (Beger[4]).—Man, aged forty-seven years. Three and a half years previously had an abscess in right iliac fossa which on operation yielded a pint of odorless pus; fistula remained and tumor grew through it. No escape of feces or flatus. Operation showed that fistula led directly to appendix, which was everywhere infiltrated with carcinoma. The appendix was about 6 cm. in length and about the thickness of one's finger. At the base of the

appendix a walnut-sized papillary tumor projected into the cecum. The patient died soon after the operation, and at autopsy metastatic involvement of the retroperitoneal glands was found. The microscopic diagnosis was adenocarcinoma.

Rolleston and Jones consider this to be the first authentic case of primary carcinoma of the appendix, and Elting, Baldauf, and Zaaijer mention it in their lists of cases.

CASE VI (Draper[9]).—Man, aged sixty-five years. Healthy until three months previous, when had alternating diarrhea and constipation. Could not retain food for three months before death. Autopsy: Stenosis of ileocecal valve. Proximal one-third of appendix dilated to size of a plum. Cecal juncture also dilated and the thickened wall typical of colloid cancer. Peritoneum normal.

CASE VII (Stimson[55]).—Female, aged forty-four years. Appendical attack lasting several weeks ten years previously. Well until two mild attacks two months before operation. "Cancerous degeneration" of appendix. Ring of thickened mucosa projecting into cecum.

CASE VIII (Mosse and Daunic[41]).—Female, aged fifty years. Had no appendical symptoms when she died of cardiac disease. Appendix only organ showing cancerous change. Tumor in mucosa and muscularis in part alveolar and in part cylindrical in type; lumen entirely obliterated.

CASE IX (Rolleston[51]).—Female, aged twenty six-years. Operation during fourth appendical attack. First was fourteen months previous. Tip was adherent to ovary and was seat of primary, spheroidal-celled carcinoma size of a marble, which infiltrated almost to serosa. Other viscera appeared normal, and were not suspected before microscopic examination. Three months later was losing flesh and strength. (Rolleston and Jones report that she was well five years later.)

CASE X (A. O. J. Kelly[26]).—Clinical history lost. Appendix 11 cm. in length; for 3 cm. at proximal end the diameter is 8 mm.; distal to this it is 1.2 cm. in diameter. There are areas of ulceration of the mucosa toward the proximal end, and just distal to these

there is an area of tumor formation 6 mm. in diameter; this consists of a connective tissue stroma which forms alveoli surrounding nests of epithelial cells. Diagnosis: Carcinoma. Good recovery, but since lost sight of.

CASE XI (A. O. J. Kelly[26]).—Mrs. E. S., aged twenty-four years. Three previous attacks, the last being three weeks before operation. No adhesions. Appendix 9 cm. in length and about 6 mm. in diameter. Lumen patent. Toward the base of the appendix its wall is infiltrated with narrow columns of cells apparently in intimate relation with the surrounding connective tissue stroma, there being no sharp demarcation between the tumor cells and the stroma, as in carcinoma. Diagnosis: Endothelioma. Patient was well when seen ten years later.

CASE XII (A. O. J. Kelly[26]).—J. M., man, aged nineteen years. Was well until nine days before operation, when he had symptoms of acute appendicitis, with a palpable mass in the right iliac fossa. Operation: Small encapsulated collection of pus about cecum and appendix, which latter was 5 cm. in length and 1 cm. in diameter. On removing a coating of fibrinopurulent exudate, the appendix proved to be much distorted. A microscopically small growth was found almost entirely within the submucosa. The tumor cells were arranged in nests supported by a stroma of altered submucosa. Diagnosis: Carcinoma of the appendix. When seen about nine years after the operation patient complained of having had occasional pains in right iliac fossa, and has had constant tenderness in the incision. No subsequent operation.

CASE XIII (A. O. J. Kelly[26]).—T. R., man, aged sixty-three years. Numerous appendical attacks shortly before operation. Appendix adherent, and, like the intestines, was studded with grayish white, miliary nodules. Retroperitoneal glands enlarged. Patient died from shock. Microscopic examination of the appendix showed it to be everywhere the seat of carcinomatous infiltration. The invading epithelial cells are sometimes in the form of nests, and elsewhere form the walls of hollow tubules.

CASE XIV (Hurdon[21]).—Mrs. G., aged twenty-four years. No symptoms pointing directly to appendix. Operation by Dr.

Kelly for release of pelvic adhesions, suspension of uterus, and removal of appendix, which latter was found densely adherent, and bulbous at its free extremity. There is a flexion between middle and outer thirds, and proximal to this the lumen is normal. To the distal side there is a soft concretion the size of a date stone, and situated in the intervening portion there is a small adenocarcinoma invading all coats. In good health when heard from nine months later.

CASE XV (Giscard[15]).—Male, aged thirty-seven years. Mild attack eight months before a more severe one, which led to operation in a few days. Abscess and local peritonitis. Obstruction of lumen at mid-appendix by cicatricial thickening, distal to which there was some pus. At this point microscopic examination showed a mixed adeno-alveolar carcinoma situated between the mucosa and muscularis and occupying about one-half of the circumference. The tumor seemed to spring from the deeper layer of the glands. Good recovery.

CASE XVI (Whipham[62]).—Female, aged forty-five years. Abdominal swelling and tumor in right iliac region. Healthy until five weeks previous, when had symptoms of malignant disease, but none pointing to appendix. Inoperable. Mass of intestines and omentum. Died in two and a half months. Primary spheroidal-celled carcinoma in base of appendix invading all coats but serosa.

Of this case Rolleston and Jones say: "This case is excluded by several authors on the ground that there were growths also in the glands, liver, and the left ovary, which last they regard as the primary seat of the disease. It is, however, accepted by Moschcowitz, who agrees with Whipham that the origin in the mucous coat of the appendix shows that the growth was primary there, a view which we also take."

CASE XVII (Sudsuki[56]).—Man, aged forty years. Discovered at autopsy. Endothelioma the size of a pea found in the lower one-third of an appendix 11 cm. in length. Lumen patent and mucosa appears normal to the naked eye. Microscope shows it to be thin and devoid of epithelium and Lieberkühn's glands. Submucosa compressed, and between it and the muscularis the

tumor is found slightly infiltrating the latter and the serosa. Endothelium of lymph spaces much proliferated, and it is believed that the tumor originated there.

CASE XVIII (McBurney[37]).—Woman, aged twenty-three years. Severe appendical attack two years previously. No adhesions. Two strictures, one near base and the other near apex, where there is a solid tumor the size of a pea. "Pure carcinoma." No metastasis.

CASE XIX (McBurney[37]).—(Lartigau's case.) Man, aged thirty years. Discovered at autopsy. No history of appendicitis. "Pure carcinoma," somewhat larger than a pea, in tip.

CASE XX (Goffe[17]).—Girl, aged fifteen years. Increasing appendical pain for one year. No mass. Typical carcinomatous tumor 5 mm. in diameter developed in appendical wall at tip.

CASE XXI (Regling[48]).—Man, aged fifty-nine years. Attack preceded by anorexia for six months, and for last six weeks had cramp-like abdominal pain. Abdomen distended. Lateral dulness disappearing on change of position. No tenderness or mass. Symptoms of obstruction led to operation. Tumor (scirrhous invading muscularis) size of hen's egg, apparently started from base of appendix, invades outer side of cecum for a short distance. Benign obliteration of free end of appendix; other end is a thick-walled dilatation filled with fish bones, etc. Stricture at ileocecal junction due to adhesion of ileum and cecum, but not malignant. Carcinoma preceded by chronic inflammation. Fecal fistula and death in four months.

CASE XXII (Jessup[23]).—Married woman, aged thirty-six years. Operation for ovarian cyst, following the last of five abortions. Appendix found surrounded by adhesions. Kink and constriction at junction of middle and distal thirds, beyond which there is a slight dilatation surrounding a firm, yellow adenocarcinoma infiltrating muscular coat. There were no symptoms pointing to appendix.

CASE XXIII (Harte and Willson[19]).—Maiden, aged twenty-four years. Appendical attack of one month's duration about five years previously. Numerous less severe attacks during entire

winter one year previously, but made apparent recovery until one month before operation, when symptoms returned. Operation: Appendix free from adhesions, and to naked eye appeared to be normal externally and internally, except for almost entire obliteration of lumen. Local infiltration of all coats by scirrhous carcinoma 1 cm. from tip. Patient was well when recently seen seven and one-half years after operation.

CASE XXIV (Harte and Willson[19]).—Frank L., aged twenty-five years (in service of Dr. Le Conte). More or less continuous pain in right iliac fossa for eight months. Operation: Appendix adherent behind cecum and ruptured near tip. Concretion size of grape seed. Sections of appendix about 1 cm. from tip showed a carcinoma simplex springing from the mucosa and involving all coats. Acute suppurative appendicitis. Good recovery until four and one-half months later, when he had symptoms of intestinal obstruction from a band of adhesions, and bowel found to be gangrenous. No evidences of malignancy. No autopsy.

CASE XXV (Weir[61]).—Man, aged twenty-three years. History of thirteen attacks of appendical pain in two years. Nothing felt through abdominal wall. Appendix strongly kinked and knobbed a little at its end. Pathological report: Usual inflammatory changes in mucous membrane and a small mass of adenocarcinoma at the tip. Patient remained in good health for three years, and was then lost sight of.

CASE XXVI (Walsham[57]).—Man, aged forty-five years. Had several appendical attacks. Operation: The appendix was thickened and ulcerated and when examined microscopically was found to be the seat of a columnar-celled carcinoma.

CASE XXVII (Norris[44]).—Mrs. L. F., aged twenty-seven years. No symptoms pointing directly to appendix. Operation for right inguinal hernia and salpingitis. Appendix reddened and adherent at tip, where lumen was occluded by a firm, yellowish white mass in its terminal centimeter; here there was an old obliteration, but elsewhere evidence only of a mild chronic inflammation. Carcinoma simplex. Well when seen four years later.

CASE XXVIII (Moschcowitz[40]).—I. S., male, aged thirty-seven years. Treated three years for supposed alcoholic gastritis.

Later, acute appendical attack with peritonitis. Operation: Free pus in abdomen. Appendix adherent and slightly gangrenous. Bean-sized adenocarcinoma in tip. No recurrence six and a half years later.

CASE XXIX (Moschcowitz[40]).—R. P., female, aged twenty years. Ten-day appendical attack. Tenderness. No mass felt. Small hard nodule 1 inch from tip. Carcinoma simplex. No recurrence three years later, when lost sight of.

CASE XXX (Moschcowitz[40]).—Mrs. G. D., aged twenty-four years. Five months pregnant. Present attack of five months' duration. Irregular fever. Leukocytes, 17,500. Pain in hypogastrium. Exploratory laparotomy negative, except for appendix adherent at tip; here lumen was obliterated and a colloid carcinoma found. No recurrence six months later.

CASE XXXI (Letulle and Weinberg[35]).—Male. Discovered at autopsy after death from tuberculosis. Total obliteration of lumen. Small adenocarcinoma at tip starting from centre of old cicatrix.

CASE XXXII (Letulle and Weinberg[35]).—Child, aged twelve and a half years. History of mucomembranous colic since infancy. Two attacks of appendicitis at interval of one year. Operation after second attack. Appendix adherent and contained an enterolith. A carcinoma of the adenocarcinomatous type was located at a point at which a stenosis had resulted from previous inflammation. Good recovery.

CASE XXXIII (Letulle and Weinburg[35]).—Female. Discovered at autopsy after death from pulmonary tuberculosis. Obliteration of lumen in distal 2 cm., where there was an adenocarcinoma below an old cicatrix.

CASE XXXIV (Letulle[34]).—L. L., male, aged thirty-five years. Discovered at autopsy after death from tuberculosis of lungs and intestines. Adenocarcinoma size of cherry-stone in tip. No adhesions.

CASE XXXV (Letulle[34]).—A. M., female, aged thirty-nine years. Discovered at autopsy after death from tuberculosis of lungs, kidneys, and intestines. Tumor size of hazelnut in tip with obliter-

ation of terminal 4 cm. of lumen. Secondary to acute appendicitis. No adhesions.

CASE XXXVI (Letulle[34]).—V. C., female, aged fifty-nine years. Discovered at autopsy after death from pulmonary and intestinal tuberculosis. Adenocarcinoma of distal end with obliterated lumen at this point only. No adhesions.

CASE XXXVII (Letulle[34]).—J. P., female, aged twenty-six years. Discovered at autopsy after death from pulmonary tuberculosis. Scirrhous cancer size of cherry-stone in tip. Overlying peritoneum normal. Adhesions over cecal half of appendix, which is chronically inflamed. Meso-appendix involved.

CASE XXVIII (Lejars[33]).—Male, aged twenty-seven years. Slight appendical attacks for three months, becoming more severe. At time of appendectomy cecum looked normal and there were no adhesions or swollen mesenteric glands. Second operation two months later. General metastasis. Microscopically no portion of appendix proved to be free from carcinoma. Polyhedral-celled type of trabecular tendency.

CASE XXXIX (Elting[13]).—Mrs. L., aged thirty-six years. Good health until eight years previously, when she had an attack diagnosticated peritonitis. No more trouble until shortly before she had a bilateral salpingo-oöphorectomy. No symptoms of appendicitis. Appendix, although apparently normal, was removed as a precautionary measure and was found to contain a small alveolar carcinoma 1 cm. from the proximal end. Lumen everywhere obliterated. In good health three years later.

CASE XL (Elting[13]).—W. D., male, aged eighty-one years. Autopsy after death from pulmonary tuberculosis and cardiac disease. No symptoms of appendicitis. Colloid carcinoma of appendix. No metastasis.

CASE XLI (Edington[12]).—Mr. P., aged forty-four years. Diagnosticated appendicitis. Had symptoms of "stomach catarrh" for two years. Operation: Body of appendix buried in adhesions (meso-appendical and enlarged glands), but tip was free. Proximally the appendix was quite narrow, distally thick, hard, and bulbous. On passing the hand toward the pylorus, a hard band of

omentum was found kinking the bowel, and was removed. Patient gradually became weaker and died in three months. Microscopic examination shows a general adenocarcinomatous infection. All coats are involved.

CASE XLII (Kaufmann[25]).—Woman, aged thirty-one years. Discovered at autopsy after death from typhoid fever. Muscular coat of appendix almost destroyed by a diffuse, solid, round-cell carcinoma.

CASE XLIII (Jones and Simmons[24]).—Female, aged twenty-six years. Six appendical attacks in twelve years. Tenderness, but no mass. Adhesions seen with microscope only. Scirrhous carcinoma near base. Small section of cecum removed at second operation and found to be normal. Also chronic appendicitis. Good recovery and well eight months later.

CASE XLIV (Eccles[11]).—Male, aged eighteen years. Two typical appendical attacks in two months. Adherent thickened appendix. Two separate, small tumor masses in wall of appendix, one at junction of proximal and middle two-thirds, and the other a little more distal. Spheroidal-cell cancer. Was well twenty-two months later.

CASE XLV (Cullingsworth and Corner[8]).—Maiden, aged thirty-one years. Two attacks of pain in right side in two weeks. Operation for fibromyoma of broad ligament. Appendix was removed on account of bulbous extremitity, which was found to contain a small spheroidal-cell carcinoma. Lumen obliterated at tip only. Eight months later patient was well, but had no appetite.

CASE XLVI (Burnam[6]).—Man, aged twenty-five years. Recurrent appendical pain for two years. Appendix adherent to its meso at tip and acutely inflamed, especially to outer third, where adenocarcinoma fills lumen and invades mucosa and muscularis.

CASE XLVII (Weir[61]).—Male, aged twenty-two years. Emaciation, cough, and abdominal distention, with ascites for two months. Was thought to have tuberculous peritonitis, but the fluid injected into guinea-pigs gave negative results. Operation revealed a large number of subperitoneal metastatic nodules, but none in viscera. Transformation of appendix into a mass of mucoid carcinoma. No adhesions.

CASE XLVIII (Weinberg[60]).—M. J., male, aged twenty-two years. Two appendical attacks, six years and one year previously. Lumen obliterated in terminal 2 cm., and here author thinks there is absolute proof that the epithelium has developed in an obliterating cicatrix, at the expense of a portion of a gland which escaped the inflammatory process and was caught in the cicatrix. Patient well four months later.

CASE XLIX (Sargent[53]).—Girl, aged twelve years. First attack. Abscess. Appendix acutely inflamed. Changes most marked beyond a pea-sized tumor which obstructs lumen half an inch from cecum. Endothelioma. Was well five months afterward. (The microscopic section from this case was seen by Rolleston and Jones, who say that it is very difficult to state positively that it is not a spheroidal-cell carcinoma.)

CASE L (Neri[43]).—E. B., male, aged twenty-nine years, who had repeated attacks of pain in the cecal region following a kick in that part five years previously. The appendix, removed at operation, showed a primary adenocarcinoma in the middle of a chronically inflamed organ. There was no metastasis.

CASE LI (Myerstein[42]).—Female, aged twenty-six years. Discovered at autopsy after death from hemoptysis. Carcinoma simplex, with traces of alveolar type invading all coats in distal half of appendix.

CASE LII (Kudo[30]).—(Einlauf, No. 876, 1905, Prosektor). Boy, aged eight years. Operation for acute perityphlitis. Tumor size of a pea in middle of appendix, invading submucosa. Muscularis and serosa not invaded. Carcinoma simplex.

CASE LIII (Kudo[30]).—(Sections Jour. No. 549, Path. Inst.) Man. No history of appendicitis. Autopsy: appendical opening enormously dilated, and hard tumor the size of a walnut protrudes 1 cm. into cecum. Adenocarcinoma, with transition into carcinoma simplex.

CASE LIV (Kudo[30]).—(Einlauf, No. 1507, 1905, Prosektor.) Man, aged thirty-five years. Acute appendicitis. Nodule size of a pea springing from mucosa at tip. Muscularis but slightly invaded. Carcinoma simplex.

CASE LV (Kudo[30]).—Woman, aged twenty-six years. Tumor size of a cherry obstructing lumen in proximal end. Middle third obliterated. Carcinoma simplex.

CASES LVI, LVII, LVIII (Korte[29]).—Unexpectedly came across three cases of carcinoma of the appendix in youthful individuals from twelve to twenty-eight years of age, once in an interval operation and twice while operating for acute appendicitis. Microscopic diagnosis of all three was adenocarcinoma, and all were living at the time they were reported.

CASE LIX (H. Kelly[28]).—(Thorndike, Boston City Hospital.) Woman, aged thirty years. Seven years of recurrent appendicitis, becoming severe one week before operation. Appendix thickened; distal portion cystic, and base indurated and carcinomatous. A portion of cecum removed with appendix. Microscopic examination: Small alveoli lined with columnar cells, which often entirely fill the lumen. All coats to serosa involved. Uneventful recovery.

CASE LX (H. Kelly[28]).—(Monks, Boston City Hospital.) Woman, aged twenty-four years. First attack; two days' illness and epigastric pain, becoming localized in right iliac fossa. Moderate tenderness to left and below umbilicus. Operation: Appendix twisted on itself. Bulbous tip enveloped in mass of inflammatory exudate. Easily separated. Yellowish nodule 0.6 cm. in diameter, 1.5 cm. from tip. Adenocarcinoma replacing mucosa and invading muscularis. Slight chronic appendicitis. Uneventful recovery.

CASE LXI (H. Kelly[28]).—(Johns Hopkins Hospital, Surg., No. 9037.) Colored man, aged nineteen years. History of abdominal cramps (recurrent), but no definite appendical attacks. Symptoms of acute appendicitis for ten days and extremely painful mass in right iliac fossa, which proved to be omentum surrounding a small fetid abscess. Temperature, 101.8° F.; pulse, 110; leukocytes, 16,000. Appendix thickened and adherent to wall of abscess. Two cm. of median portion of lumen obliterated by an alveolar carcinoma invading all coats. Small perforation at distal end of tumor. Uneventful recovery.

CASE LXII (Driessen[10]).—Removed an appendix from a young married woman after a third attack of appendicitis. The appen-

dix showed a small alveolar carcinoma in the middle of a chronic inflammatory mass which obliterated the lumen of the organ at its middle. There had been no recurrence after five and a half years.

CASE LXIII (Battle[3]).—Girl, aged fourteen years. Four appendical attacks in one year. Operation: Mass of omentum adherent to bowel. Appendix removed with difficulty. Was twisted on itself. One constriction near distal end which cut off marble-like portion full of pus, and another a little nearer cecum beyond a hard, yellowish white, spheroidal-celled carcinoma the size of a marble.

CASE LXIV (Barrow[2]). A. H., girl, aged eighteen years. First attack. Symptoms of appendicitis following diphtheria, together of one month's duration. Bulbous tip of appendix adherent to posterior wall of cecum. Local area of inflammation in cecum, colon, and ileum, but apparently no malignant infiltration. Mesenteric glands enlarged. Cancerous involvement of bulbous, distal one-third of appendix only, where there were two small tumor nodules. Polymorphous type.

CASE LXV (Baldauf[1]).—(Bender Lab. 128, 1904.) Mr. H., aged thirty-eight years. Previously well. Symptoms of appendicitis the day before operation. Appendix bound down by adhesions and underneath umbilicus. Beginning peritonitis. Easy removal. Uneventful recovery. Pathological examination: Appendix considerably thickened and covered with fibrin. Lumen patent. Mucosa injected and the seat of foci of necrosis. Anatomical diagnosis: Acute appendicitis. Microscopic examination: At mesenteric side, mucosa is ulcerated and replaced by a new growth invading all coats and infiltrating meso. Microscopic diagnosis: Carcinoma simplex with ulceration. Acute appendicitis. Periappendicular suppuration.

CASE LXVI (Baldauf[1]).—Mr. B., aged twenty-three years. Two appendical attacks six and five months previous, and a last beginning five days before operation. Clinical diagnosis: Subacute appendicitis. Appendix removed with difficulty. Pathological examination: Obliteration of lumen. Fibrous tags externally. Tumor not suspected until microscopic examination;

mucosæ replaced by carcinoma simplex invading muscularis, and to mesenteric side, subserous tissue.

CASE LXVII (Baldauf[1]).—Girl, aged eight years. Previous history negative. No symptoms referable to appendix until two days before operation, when she had a severe appendical attack. Appendix surrounded by inflammatory mass, which ruptured during removal, and a small amount of pus escaped. Pathological examination: Proximal half normal, other end thickened and indurated and surrounded by a layer of partially organized tissue. Lumen normal. Anatomical diagnosis: Partial organization of peri-appendicular abscess. Microscopic examination: Carcinoma simplex, involving submucosa. Muscularis uninvolved.

CASE LXVIII (Warthin[59]).—Married woman, aged thirty-two years. Salpingitis with mass of adhesions involving ovary, appendix, cecum, and small intestine. Appendix alone carcinomatous and lumen obliterated. No naked eye evidences of malignancy. Microscope showed involvement of all, including proximal, sections, so condition may have extended into cecum. Basal-celled carcinoma. Was well three years later.

CASE LXIX (Landau[31]).—Woman, aged thirty-three years. Curettement at eighteen, followed by violent local peritonitis. Operation for removal of myoma of uterus and left-sided adnexæ. Removal of appendix, which was rigid, bent on itself in several places, and thickened at the apex. Its mesentery adherent to colon. Length, 6.5 cm. Proximal half short and normal; tip hard. No enlarged glands. Microscope shows carcinoma simplex.

CASE LXX (Zaaijer[64]).—Woman, aged thirty-seven years. Chronic appendicitis, with exacerbations. Numerous adhesions found at operation. Chronically inflamed mucosa, with traces of acute abscess formation. Pea-sized tumor at apex showing, histologically, a solid alveolar carcinoma. Walls infiltrated to subserosa.

CASE LXXI (Zaaijer[64]).—Girl, aged twenty years. Symptoms of hysteria and chronic appendicitis. Operation: Appendix somewhat thickened, with local, chronic peri-appendicitis. At apex, an obliteration 1 cm. in length was the seat of an extremely small neo-

plasm (0.5 x 1.1 x 1.1 mm.). No apparent connection between this and the surface of glandular epithelium. Diagnosis: Carcinoma solidum diffusum. Patient showed no evidence of recurrence fourteen months later.

CASE LXXII (Zaaijer[64]).—Miss ——, aged twenty-six years. Vague abdominal symptoms for several years, culminating finally in a well-marked appendicitis. Appendix firmly adherent, with tumor 3.5 cm. long in tip. Mixed adeno- and cylindrical-celled carcinoma. Infiltration of mesentery, and extension along blood-vessels to peritoneum. No sign of recurrence six months later.

CASE LXXIII (Zaaijer[64]).—Man, aged twenty-five years. Chronic relapsing appendicitis for thirteen years. Operation: Marked adhesive peri-appendicitis. Mucosa and glandular tissue atrophic. Submucosa greatly thickened. Gelatinous mass size of a lima bean in apex. Appearance was that of colloid cancer, although positive proof of this could not be given even with the microscope.

CASE LXXIV (Zaaijer[64]).—Girl, aged twenty-three years. Appendectomy one month after a first, slight attack of appendicitis. Appendix showed a marked chronic inflammation, with a pea-sized tumor near the tip, projecting polyp-like into the lumen. Infiltration of submucosa, muscularis, and mesentery. Tumor was partly adenomatous and partly of the solid type. No evidence of recurrence two and a half years later.

CASE LXXV (Zaaijer[64]).—Girl, aged twelve years. Appendectomy one month after first attack. Evidences of chronic appendicitis, especially in subserosa. In the tip was found a bean-sized carcinoma of the round-celled type, which had compressed the surrounding tissues, but had infiltrated the muscularis at but one point. No evidence of recurrence after three years.

CASE LXXVI (Zaaijer[64]).—Girl, aged seventeen years. Appendectomy after two weeks of appendicitis. Stricture 2 cm. from tip. Proximal portion of stricture contained a pea-sized carcinoma of the solid type, with adenomatous tendency.

CASE LXXVII (Schrumpf[54]).—Woman, aged thirty-five years. Discovered at autopsy after death from transverse myelitis. Small,

hard tumor the size of a hazelnut at distal end of appendix. Serosa pale and unirritated. Mucosa replaced by adenocarcinoma, which infiltrates the submucosa, and at one point the muscularis.

CASE LXXVIII (Patel[46]).—Man, aged fifty-eight years, who had had double inguinal hernia for twenty-five years. For last two months the right hernia was painful and of late could not be returned as formerly. Operation: Appendix found lying free in sac with its tip distended and filled with small foreign bodies, one of which resembled a fish bone, and another a scale of enamel. The wall was thick and hard and on microscopic examination the tip was found to be the seat of a scirrhous carcinoma. Good recovery.

CASE LXXIX (Mason and Rhea[36]).—F. H., housewife, aged twenty-two years. Three gynecological operations in three years. During the last the appendix was removed, although apparently normal, and microscope showed scirrhous cancer in tip. No metastases found in the other organs examined.

CASE LXXX (Hessberg[22]).—Female, aged seventy-six years. Found at autopsy. No history of appendical trouble. Appendix sprung from posterior wall of cecum and was wound around latter so that appendical lumen was only visible to microscopic examination. Tumor nodules the size of a pea. Carcinoma simplex.

CASE LXXXI (Henking[20]).—Man, aged twenty-three years. History of diarrhea. Appendix removed two years ago; ever since has had pain in right iliac fossa, which has increased in the last three months. Six months before lost a pint of blood by bowel. Abdomen tender, especially in right iliac fossa, where there is dulness and fluctuation. Operation: Abscess in scar tissue. Second operation ten days later. Medullary carcinoma of stump of appendix invading ileum and cecum, which were resected. Gelatinous swelling of peritoneum.

CASE LXXXII (Grünbaum[18]).—Female, aged nineteen years. Violent pain in cecal region one month before admission. During operation for pyosalpinx appendix was found adherent to reddened and enlarged ovary. Tip of appendix thickened and the seat of a yellowish, dense carcinoma simplex invading all coats. Mesenteric glands uninvolved. No metastasis into tubes or ovaries.

CASE LXXXIII (Brandts[5]).—Boy, aged eight years. Ten weeks before admission had pain in right iliac fossa, fever, distention, and obstinate constipation. Second attack six weeks later, and third attack four days before operation, with vomiting, etc. Operation: Intestines covered with fibrin. Appendix was perforated to the proximal side of a small mass. Removal. Appendix 6 cm. in length.

Microscope shows the small mass to be a solid carcinoma, to which the perforation was secondary. Necrotic inflammation. The carcinoma produced stenosis, and inflammation followed.

CASE LXXXIV (Brandts[5]).—Man, aged thirty-five years. Had pain in right hypochondrium for several years; was frequently jaundiced and had clay-colored stools. Also attacks of pain in right iliac fossa. Physical examination: Tenderness over gall-bladder and appendix. No tumor in liver region. Operation: Gall-bladder and ducts negative. Appendix 8 cm. long, with small tumor in its tip. Microscopic examination: Scirrhus, with suspicion of adenocarcinoma.

CASE LXXXV (McWilliams[38]).—Maiden, aged twenty years. Never sick until had typical, acute appendical attack on arrival at Ellis Island. Three ounces of pus evacuated. Enteroliths and mucopus in lumen, also spheroidal-celled scirrhus cancer size of a pea in tip. All coats but serosa invaded.

CASE LXXXVI.—Oberndorfer,[45] in speaking of small intestinal cancers that had come under his observation, mentions a carcinoma of the appendix in a boy, aged seven years. As no details are given, this case is of a doubtful nature.

CASE LXXXVII (White[63]).—Woman, aged seventy-five years, died on the ninth day of an attack of acute intestinal obstruction due to a Richter's hernia into the right femoral ring. Thirty-five years previously she had what seems to have been an attack of acute appendicitis. At autopsy the appendix was found bound down to the posterior wall of the abdomen by dense adhesions, and was $2\frac{1}{2}$ inches in length, and, toward the distal extremity, $\frac{1}{2}$ inch in diameter. Microscopically, there was an irregular overgrowth of epithelium invading the deeper tissues. In places there was a

glandular formation, but most of the cells had undergone a complete colloidal degeneration. A single gland at the ileocecal angle was enlarged to the size of a cherry and proved to be carcinomatous. The cecum and other viscera were free from infection.

CASE LXXXVIII (A. O. J. Kelly[27]).—Mrs. S. B., aged twenty-three years. Severe appendical attack five years, and mild attack four weeks before. Constipated since first attack. Palpation negative except for local tenderness. Operation: Appendix kinked of itself and curled around cecum. Appendix cut out of cecum. On section a newgrowth is seen to extend from the tip, almost, if not quite, to the proximal end. All coats are invaded and the thickness of the organ is increased. The lumen is almost completely occluded except at proximal end. Microscopically, there are lesions of chronic appendicitis with evidences of acute exacerbation. The epithelial cells are arranged in nests and some have undergone mucoid change. In good health one year after operation.

CASE LXXXIX (A. O. J. Kelly[27]).—Miss F. L. B., aged seventeen years. Eight hours before admission to hospital was seized with acute, general abdominal pain, gradually becoming localized in right iliac region. Abdomen rigid on right side and local tenderness over McBurney's point. No mass. Operation: The appendix, which was non-adherent, was 9.5 cm. in length and about 1 cm. in thickness, the distal 6 cm. being the more distended. The serosa was coated with fibrin. About midway a well-marked constriction was found separating proximal and distal portions. and the latter was filled with a sanguinopurulent material. Macroscopic evidences of a newgrowth were first seen while sections were being prepared for microscopic examination. A small infiltration of the submucosa, opposite the mesentery, extended 1.5 cm. from the constriction to the proximal end. Microscopically, there were evidences of a moderate grade appendicitis. The tumor consisted of narrow columns of cells infiltrating the submucosa. In some regions the origin of the cells from the endothelial lining of the lymph channels is obvious in their lining such spaces. Microscopic diagnosis: Endothelioma and acute appendicitis.

CASE XC (A. O. J. Kelly[27]).—Miss L. B., aged twenty-seven years. During last two years has had severe attacks of pain in upper right abdominal quadrant. During first attack had a chill, and pain was referred to right shoulder. Was jaundiced for two months. Operation: Gall-bladder normal. Appendix 8 cm. long and 0.3 thick, except for a bulbous enlargement 1.3 cm. at tip. Newgrowth was not observed on macroscopic examination, but was later found to comprise a small nodule about 3 mm. in diameter extending 2 cm. from the tip of the organ. The tumor consists of nests of epithelial cells supported by a well-developed connective tissue stroma; the submucosa especially is the seat of the infiltration, but the muscularis is also slightly invaded, even to the subserosa. Diagnosis: Carcinoma and chronic appendicitis with exacerbation. Uneventful recovery.

CASE XCI (A. O. J. Kelly[27]).—Miss M. K., aged twenty-eight years. Previously well. Attack began a few days before operation with severe cramp-like pains in abdomen, which became localized in right iliac fossa. There was marked rigidity and tenderness of the right abdomen, with nausea and vomiting, and a definite mass could be palpated. Operation: Considerable pus evacuated. Appendix acutely inflamed, perforated, and adherent to colon. The appendix was 6 cm. long and from 0.6 cm. to 1.5 cm. in thickness. The tip was much dilated—the lumen to 0.8 mm. in diameter, and contained a hard calculus. The tumor could only be detected with the microscope, which revealed evidences of acute inflammation and showed the newgrowth to be limited to the tip. It consists of nests of epithelial cells, in a well-developed connective tissue stroma, replacing the mucosa and infiltrating the muscularis. Diagnosis: Carcinoma and acute ulcerative appendicitis with perforation. Uneventful recovery.

CASE XCII (Le Conte[32]).—T. R., woman, aged twenty-one years. Attacks of sharp pain in appendical region for ten years. Final attack lasted one week. Violent pain, soreness and palpable tumor size of a hickory nut in same region, and nausea.

Intussusception of appendix into cecum, with tip protruding. Ileocolic glands enlarged. Portion of cecum excised with

appendix, and pathological report suggested a wider carcinomatous involvement. Six weeks later a more extensive resection was performed, with removal of 7 inches of bowel and a number of mesenteric glands, two of which showed metastatic involvement from the primary adenocarcinoma in the appendix.

CASE XCIII.—Faulder[66] reported a case in which the appendix was removed after three appendical attacks. The appendix was infiltrated with a columnar-celled carcinoma undergoing spheroidal-celled change. He suggests that these growths should be regarded as epitheliomata. No recurrence after four years.

CASE XCIV (Grieg[68]).—Man, aged thirty-five years. That the appendix was carcinomatous was not suspected until the pathological examination proved it to be an atypical cylindrical-celled carcinoma with an alveolar tendency. At operation the mass was removed with great difficulty. No recurrence after two years.

CASE XCV (Vassmer[75]).—Woman, aged twenty years, who had a primary carcinoma in a gangrenous appendix, accompanied by peritonitis. During a secondary enterostomy the patient died.

CASE XCVI (Weber[77]).—Man, aged forty-three years. During an operation for ventral hernia a tumor, the size of a man's fist, proved to be an adenocarcinoma of the appendix. He had been operated upon three years previously for an appendical abscess. Recovery.

CASE XCVII (Hammond[69]).—Patrick G., aged thirty-five years. Family history negative. Eighth attack, the first having been thirteen months previous. A small, hard, tender, pulsating mass could be outlined on deep palpation. The pulsation proved to be due to an attachment of the tumor over the external iliac vessels. There were no general adhesions and no enlargement of the mesenteric glands. The tumor, which was of pyriform shape, was hard and dense and measured approximately one and one-eighth inches in diameter. It was situated in the distal end of the appendix, although the terminal one-fourth inch was free from invasion. The proximal portion of the appendix was also normal. Although the mucosa of the portion occupied by the tumor was thickened

and dense, it could be readily withdrawn from the tumor like the piston from a syringe. Pathological diagnosis: Infiltration carcinoma. Unfortunately no microscopic description was given.

CASE XCVIII (Jong,[70] from McWilliams).—Female, aged forty years. Patient had diarrheal attacks for four years, which were referred to a chronic appendicitis. Removal of the appendix cured the attacks. Appendix found to have a very thick proximal mucous membrane and a stenosis 2.5 cm. from the tip, which caused a thick-walled cyst in tip. In the appendix chronic lesions found generally, and a cancer in the cyst.

CASE XCIX (Lothrop[72]).—Girl, aged nine years. Was well until one month ago, when she began to have general abdominal pain, which gradually became localized in right lower abdomen and was accompanied by tenderness. Palpation revealed a mass the size of a hen's egg. Operation developed a walled-off appendical abscess. Appendix was perforated in a gangrenous patch. No evidence of cancer at time of operation, but it was revealed during the pathological examination.

CASE C (Letulle,[71] from Nélaton).—Woman, aged twenty years, having previously been healthy, had an attack of acute appendicitis. At operation (1906), seven weeks after the attack, the appendix, which was free from adhesions, was found to be clubbed at the free extremity. The tip contained a pea-sized, pedunculated tumor, which on microscopic examination proved to be a simple carcinoma. (Illustration.)

CASE CI (Letulle[71]).—D. L., woman, aged thirty years. During an operation on the uterine adnexa the appendix was seen to be enlarged, and was therefore removed. The tip was somewhat enlarged and more dense than the remainder of the organ, and the lumen was obliterated in the terminal 1 cm. Here a carcinoma had developed in an old cicatrix from an old ulcerative appendicitis. Microscopic examination showed it to be of the simple variety.

CASE CII (Letulle,[71] from Récamier).—Woman, aged sixty years, was operated upon (1905) for a left inguinal hernia, which had been tender to pressure. On opening the sac there was a flow of gelatinous liquid having the appearance of apple jelly, but

the intestines were not found. A laparotomy was performed, and the pelvis proved to be filled with the same colloid material. The uterus and adnexa were normal, as was also the cecum. At its base the appendix for 1.5 cm., although slightly enlarged, was regularly cylindrical. Beyond this point it widened out rapidly into a funnel-like form and opened freely into the peritoneal cavity. This cornucopia was filled with the colloid material. The lumen of the proximal portion of the appendix was obliterated as the result of an old inflammation.

CASE CIII (Letulle[71]).—Adèle B., woman, aged sixty-five years. Patient died of uremia and cardiac trouble a few days after admission (1906). The autopsy findings are given in great detail and are beautifully illustrated. The appendix, which is dense and rigid, is adherent to the back of the cecum, and on opening the latter a cauliflower-like growth the size of a walnut is seen to protrude from the appendical orifice. Throughout its extent the lumen of the appendix is more or less blocked up with a similar growth, which is undergoing colloid change. The predominating cells are cylindrical. On account of its cecal invasion the case should no doubt be excluded from a list of purely appendical cancers, but as it was most certainly primary in the appendix an exception is made. There were no metastases to other organs.

CASE CIV (McWilliams[74]).—Woman, aged twenty years. Recent immigrant from Germany, who had never been sick before. There was a zone of rigidity and tenderness about a palpable mass at McBurney's point, the size of a lemon. At operation a walled-off abscess was opened. Appendix adherent to pelvic wall and perforated in a gangrenous patch one inch from the base. The tip was clubbed and hard, and while on superficial examination a diagnosis of acute inflammation was made, microscopic study proved it to be a polyhedral-celled carcinoma associated with acute peri-appendicitis.

CASE CV (McWilliams,[74] from McCosh).—Male, aged twenty-five years. Three appendical attacks in eight months. Operation during recovery from last attack revealed inoperable mass three and one-half by one and one-half inches in size. It was

considered to be malignant and to involve cecum, appendix, and peritoneum. Readmitted twenty months later, having had cramp-like pains in region of old scar for eight months. No cachexia. Hard mass the size of a walnut palpated. Intestines and omentum matted together. Retroperitoneal and mesenteric glands enlarged. Stumpy appendix separated from intestines with difficulty. Microscopic diagnosis: Spheroidal-celled carcinoma. No recurrence after nine years.

CASE CVI (McWilliams,[74] from Wiener).—Male, aged thirty-five years. History of inflammation of bowels as a child, and six months' attack of indigestion five years previous to operation. At time of operation had symptoms of acute appendicitis. Palpation negative. Dense adhesions about cecum, including appendix. Near the tip of the latter there was a small gland-like tumor, which on microscopic examination proved to be an adenocarcinoma. An enlarged mesenteric gland proved to be merely hyperplastic. Obliteration of appendical lumen. No recurrence after four years.

CASE CVII (Garrow and Keenan[67]).—Miss E. Y., aged twenty-one years. Seven years ago had a short attack of "dead soreness" in appendical region, which was aggravated by overexertion and menstruation; otherwise health was good. During the last month has had five severe attacks of pain and vomiting, each attack confining her to bed for a day or so. In the intervals she was free from pain, but tenderness was constant in right pelvis, where a small mass could be palpated. At operation (1906) the appendix was slightly adherent and the proximal one inch was occluded, while the thinned out terminal part contained clear mucoid material. At the time of the operation it was considered a typical obliterating appendicitis, but *routine* microscopic examination showed the occluding mass to be a cubical-celled carcinoma infiltrating all coats.

CASE CVIII (Garrow and Keenan[67]).—J. F., girl, aged thirteen years. Acute appendical attack coming on a few days previously. At operation (1907) there was free pus, and the slightly adherent appendix was gangrenous and perforated at its distal third. Elsewhere it was congested only. At the beginning of the gangrenous

portion the lumen was blocked by a small, cubical-celled carcinoma microscopically resembling a rodent ulcer. The greater portion of the tumor projected into the lumen, but it also invaded the muscular coats to the serosa. No recurrence when seen one year later.

CASE CIX (Voeckler[76]).—Miss E. F., aged twenty-seven years. Severe appendical attack, with repetitions the same year, nine years ago. Then well until two years ago. During these last two years she has had pains in right iliac fossa, leading to a severe attack recently, when a small, tender tumor the size of one's finger could be palpated in appendical region. Operation, 1907. Appendix adherent to abdominal wall and somewhat injected, but otherwise apparently normal. No thickening or enterolith. Appendix 3.5 cm. long. Apex obliterated and mucosa and submucosa changed into cancer tissue.

CASE CX (Becker[65]).—Man, eighteen years of age. The author gave a microscopic demonstration of a specimen of primary carcinoma of the appendix. The tumor was removed during an operation for chronic appendicitis.

CASE CXI (Lubarsch[73]).—Man, aged seventeen years (heterotopic epithelial proliferation and carcinoma). Apex of appendix contains a solid carcinoma the size of a pea; 2.5 cm. above the tumor at points which were perfectly free from carcinoma, histologically, large follicles were found in the mucosa and follicles and glands in the submucosa.

FOLLOWING ARE THE BRIEF RÉSUMÉS OF THE CASES OF SARCOMA OF THE APPENDIX.

CASE I (Gilford[14]).—(Sarcoma.) Woman, aged twenty-seven years, with symptoms of chronic appendicitis for thirteen years. Spindle-celled sarcoma of appendix, which was adherent to colon and ileum, which were uninvolved.

CASE II (Glazebrook[16]).—(Sarcoma.) G. G., colored man, aged fifty-five years. Discovered at autopsy after death from apoplexy. Appendical adhesions. Dense, fibrous, endothelial

sarcoma the size of a pigeon's egg, near tip. Originated in serosa and invaded all coats.

CASE III (Warren[58]).—(Sarcoma.) Boy, with symptoms of chronic appendicitis, intermittent pain, and fever for one month. Tumor of ileocecal angle, with involvement of appendix. Round-cell sarcoma, with glands extending to root of mesentery. Was well four years later.

CASE IV (Patterson[47]).—(Sarcoma.) Man, aged thirty-nine years. History of uneasiness in right iliac fossa for three months. Occasional sharp pain. No vomiting until acute attack before operation. Tender mass in appendical region. Operation: Appendix thick, firm, and adherent. Cecum thickened for $\frac{1}{4}$ inch about appendix. Thickened portion of cecum removed with appendix. Patient died six hours later. Autopsy: No trace of tumor elsewhere. Round-cell sarcoma beginning in appendix and involving all coats with exception of serosa.

CASE V (Carvardine[7]).—(Sarcoma.) Female, aged forty-five years. Symptoms of appendicitis for five months. Severe pain in right iliac fossa, diarrhea, and frequent attacks of severe colic. Tenderness and deep-seated swelling in same region. Operation: Appendix $3\frac{1}{2}$ inches long and the size of one's thumb; very hard, adherent, olive-shaped tip. Cecum not involved, but head and neighboring enlarged gland removed. Recurrence on left side. Death nine months later. Microscope shows lymphosarcoma.

CASE VI (Carvardine[7]).—(Sarcoma.) Man. Appendix removed for relapsing appendicitis. The central portion contains a small fecal concretion, and in the apex there is a whitish tumor the size of a hazelnut. Several of the neighboring glands are enlarged. Microscopically, the tumor consisted almost entirely of lymphoid tissue. Author speaks of it as a lymphosarcoma (also as a lymphocytoma).

REFERENCES.

1. Baldauf. Albany Medical Annals, 1905, xxvi, p. 804.
2. Barrow. Georgia Practitioner, 1905, i, p. 43.
3. Battle. Lancet, 1905, ii, p. 291.
4. Beger. Berl. klin. Wochenschr., 1882, xli, p. 616.
5. Brandts. Münch med. Wochenschr., 1907, lv, p. 1780.

6. Burnam. Johns Hopkins Hosp. Bull., 1904, xv, p. 136.
7. Carvardine (Sarcoma). British Medical Journal, 1907, ii, p. 1771.
8. Cullingsworth and Corner. Lancet, 1904, ii, p. 1340.
9. Draper. Boston Medical and Surgical Journal, 1884, cx, p. 131.
10. Driessen. Nederlandsch Tijdschr. v. Geneeskunde, 4 Maart, 1905, i, p. 9.
11. Eccles. American Journal of the Medical Sciences, 1904, cxxxi, p. 996.
12. Edington. Glasgow Medical Journal, 1903, lx, p. 120.
13. Elting. Annals of Surgery, 1903, p. 549.
14. Gilford (Sarcoma). Lancet, 1893, ii, p. 241.
15. Giscard. Toulouse Imp. St. Cyprien, 1900, cccIx, p. 51.
16. Glazebrook (Sarcoma). Virginia Medical Monthly, 1895, p. 211.
17. Goffe. Medical Record, 1901, lx, p. 14.
18. Grünbaum. Berl. klin. Wochenschr., 1907, No. 31.
19. Harte and Willson. The Medical News, August 2, 1902.
20. Henking. Deutsch. Zeit. für Chir., 1907, lxxxii, p. 743.
21. Hurdon. Johns Hopkins Hosp. Bull., 1900, p. 175.
22. Hessberg. In Diss. München, 1904; or Kudo, Zeit. f. Krebsforsch, 1907, Band 6, Heft 2, p. 402.
23. Jessup. Medical Record, 1902, lxii, p. 289.
24. Jones and Simmons. Boston Medical and Surgical Journal, 1904, cli, p. 566.
25. Kaufmann. Lehrbuch der Spec. path. Anat., Berlin, 1904, S. 464.
26. Kelly, A. O. J. Deaver's Treatise on Appendicitis, second edition; and University Med. Mag., May, 1900.
27. Kelly, A. O. J. American Journal of the Medical Sciences, 1908, cxxxv, p. 851.
28. Kelly, H., and Hurdon. The Vermiform Appendix and Its Diseases. Saunders, 1905.
29. Korte. Ver. der deutsch. Gesellschaft für Chir. Kongress, Berlin, Hirschwald, 1905.
30. Kudo. Zeit. f. Krebsforsch, 1907, vi, p. 402.
31. Landau. Berl. klin. Wochenschr., 1906, xliii, p. 1556.
32. Le Conte. Annals of Surgery, June, 1908.
33. Lejars. Bull. et Mémoirs de la Soc. de Chir. de Paris, 1903, xxix, p. 96.
34. Letulle. Bull. et Mémoirs de la Soc. Anat. de Paris, 1903, p. 638.
35. Letulle and Weinberg. Arch. des sciences médical. G. Masson, 1897; also Letulle in Rev. de Gynec. et de Chir. Abdom., 1907, xi, p. 875.
36. Mason and Rhea. Boston Medical and Surgical Journal, January 10, 1907.
37. McBurney. Medical Record, 1901, p. 478.
38. McWilliams. Annals of Surgery, 1908, lxvii, p. 116.
39. Merling. Journal de l'Expérience, 1838. (See Elting.)
40. Moschcowitz. Annals of Surgery, 1903, p. 891.
41. Mosse and Daunic. Bull. de la Soc. Anat. de Paris, November, 1897.
42. Myerstein. In Diss. München, 1905; also Kudo, Zeit. f. Krebsforsch, 1907, vi, p. 402.
43. Neri. Zeigler's Beit. zur path. Anat. und allg. Path., 1905, xxxvii, Heft 1.
44. Norris. University of Pennsylvania Medical Bulletin, November, 1903.
45. Oberndorfer. Verhandlungen der deutsch. path. Gesellschaft, 1907, p. 113.

46. Patel. Lyon Médical, 1907, cix, p. 276.
47. Patterson (Sarcoma). The Practitioner, 1903, p. 55.
48. Regling. Deutsche Zeit. für Chir., 1902, lxv, p. 360.
49. Ribbert. Beit. zur Entstehung der Geschwulste, 1906.
50. Rokitansky. Med. Jahrbucher, 1867, xiii, p. 179; also Wien. med. Presse, 1866.
51. Rolleston. Lancet, 1900, ii, p. 11.
52. Rolleston and Jones. Lancet, 1906, i, p. 1525; also American Journal of the Medical Sciences, 1906, cxxxi, p. 951.
53. Sargent. Lancet, 1905, p. 889.
54. Schrumpf. Beit. zur norm. und path. Anat. des Wurm. Mitteil. aus dem Grenzegebieten der Med. und Surg., 1907, xvii, p. 167.
55. Stimson. Annals of Surgery, 1896, xxiii, p. 186.
56. Sudsuki. Beit. zur norm. und path. Anat. des Wurm. Mitteil. aus dem Grenzgebieten der Med. und Surg., 1901, vii, p. 516.
57. Walsham. St. Bartholomew's Hosp. Reports, 1903, xxxix, p. 183, of Registrar's Report.
58. Warren (Sarcoma). Boston Medical and Surgical Journal, February 24, 1898.
59. Warthin. The Physician and Surgeon, Detroit, December, 1906.
60. Weinberg. Bull. et Mém. de la Soc. anat. de Paris, Mars, 1905, Année 80.
61. Weir. Medical Record, 1903, i, p. 805; also Proceedings of the New York Pathological Society, 1905-6, p. 128.
62. Whipham. Lancet, February, 1901.
63. White. American Journal of the Medical Sciences, 1908, cxxxv, p. 702.
64. Zaaijer. Nederl. Tijdschr. voor Geneeskunde, 1906, Tweede Helft, No. 6; also Brun's Beiträge zur k. Chir., 1907, liv, p. 239.
65. Becker. Münch. med. Woch., July 10, 1906, p. 1383.
66. Faulder. Lancet, 1906, i, p. 598.
67. Garrow and Keenan. Montreal Medical Journal, 1908, xxxvii, p. 340.
68. Grieg. Lancet, 1907, ii, p. 1466.
69. Hammond. Annals of Surgery, 1908, xlviii, p. 192.
70. Jong. Mitt. aus d. Grenzg. der Med. und Chir., 1907, xviii, p. 525.
71. Letulle. Rev. de Gynec. et. de Chir. Abdom., 1907, xi, p. 875.
72. Lothrop. Boston Medical and Surgical Journal, 1908, p. 450.
73. Lubarsch. Verh. der Deutsch. Path. Gesell., 1906, xvi, p. 208.
74. McWilliams. American Journal of the Medical Sciences, 1908, cxxxv, p. 822.
75. Vassmer. Deutsch. Zeitschr. f. Chir., 1908, xci, p. 446.
76. Voeckler. Archiv f. klin. Chir., 1908, lxxxvi, p. 477.
77. Weber. Petersb. med. Woch., 1906; Ref. Deutsch. med. Wochen., 1907, p. 1110.

CARCINOMA OF THE APPENDIX, WITH METASTASIS TO THE ILEOCOLIC GLANDS.

By ROBERT G. LE CONTE, M.D.,
PHILADELPHIA.

THE subject of carcinoma of the appendix has been extensively reviewed by my colleague, Dr. Harte, and it is clear that the diagnosis of this disease, when limited to the appendix, cannot be made before operation. Even after operation the pathologist is generally the first to discover its presence in an organ removed for other causes. In the majority of cases the disease seems to be entirely confined to the appendix, and the removal of that organ brings about a cure. In a few cases, however, the microscopic examination reveals that the disease has gone beyond the appendix, and these cases are of interest to the surgeon, for they compel a second more or less dangerous operation. I desire to report a case of this type in which the primary growth in the appendix has spread to the cecum and presented metastases in the ileocolic glands:

A. B., female, aged twenty-one years, single, white, American. The family history was negative, except that many members were rheumatic, the patient herself being a frequent sufferer. She had had most of the diseases of childhood, including scarlet fever, followed by nephritis. From the age of eleven years, that is, for ten years, she had repeated attacks of sharp pain, localized in the right iliac fossa, sometimes with chilly sensations and slight fever; at other times with no disturbance of temperature. The sharp pain would last from a few hours to a day or two, and subside with a feeling of soreness. These attacks were usually attributed to some indiscretion in diet.

April 20, 1907. The patient was seized with violent pain in the appendix region while at dinner; the pain was so severe that she almost fainted. She had chilly sensations and felt slightly feverish; had nausea, but no vomiting. After a couple of hours the pain lessened in severity and was followed by a feeling of discomfort and soreness in the right iliac region. During the next five days she had several slight attacks of this colic.

25*th*. I saw the patient in consultation with Dr. Henry C. Earnshaw.

Physical Examination. Thin, but not emaciated; color good; slight lateral curvature of the spine. Chest negative; temperature and pulse normal; abdomen retracted; no rigidity; slightly tender mass the size of a hickory nut palpable in appendix region; cecum distended with gas; urine contained a trace of albumin, but no casts. There was some anemia. Red blood corpuscles, 4,264,000; hemoglobin, 75 per cent.; leukocytes, 8600. Operation was advised and accepted.

27*th*. The abdomen was opened through a gridiron incision and the palpable mass was found to be an intussusception of the appendix into the head of the cecum. About an inch of the tip of the appendix was visible beyond the cecal margin. The portion within the cecum was almost round and nearly an inch in diameter. It felt like an inflammatory mass, and was thought to be due to the chronic condition of the intussusception. The portion of the cecum containing this mass was resected and the opening closed with Lembert sutures. A small, pin-head sized, pearly mass was noticed on the cecum an inch beyond the area resected, but at the time of operation nothing was thought of it. The ileocolic glands were somewhat enlarged. The abdomen was closed with layer sutures and the recovery was uneventful. The patient was discharged from the hospital May 11, 1907, in good condition, weighing 116 pounds.

The examination of the specimen was made by Dr. Warfield T. Longcope, Director of Ayer Clinical Laboratory, and the findings confirmed by Prof. Allen J. Smith, of the University of Pennsylvania.

Pathological Report. The specimen consists of a portion of the cecum and the appendix. The major portion of the specimen consists of a rounded, mulberry-like mass, 2.5 cm. in diameter, which has a mottled red and yellow surface. This is said to be the mucous membrane of the colon, though it has lost all resemblance to normal mucous membrane.

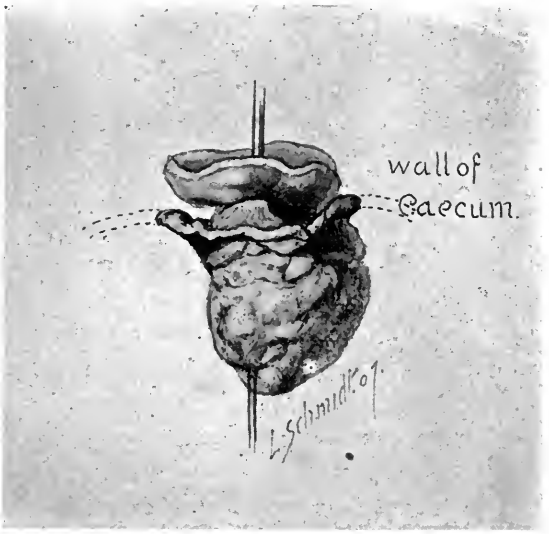


FIG. 1.—Gross appearance of specimen. The tip of the appendix has been widely opened and a probe passed through its lumen.

Toward the middle of the specimen there is a collar-like contraction, and the colon surface forms a little frill about it. Coming out from this collar is the tip of the appendix, which forms a curved bulbous knot about 2 cm. in length and 1 cm. in diameter. The surface is fairly smooth and white. Here and there are a few yellow, pin-point nodules. It has a cystic feel. When it is opened, a thick, buttery material escapes. The lining is thick, opaque, and white. The lumen can readily be found, and a probe passes into it from the colon and out through the most prominent portion of the main mulberry-like mass. Evidently there is a partial invagination of the appendix in the colon.

Sections are made through the tip of the appendix. It has been opened. Instead of the mucous membrane there is an irregular growth of cells arranged in more or less solid alveoli. The spaces filled with cells are separated by a moderate amount of connective tissue stroma. The cells forming these nests are oval, regular, and contain quite deeply staining round nuclei. The protoplasm is poorly made out. No karyokinetic figures are seen. Here and there a space is seen lined by high columnar epithelium filled with mucus. They resemble the normal crypts of the appendix. The growth is seen extending down into the submucosa and infiltrating the muscular coats. The small nodule on the external aspect of the appendix is composed of a growth like that of the appendix itself.

When it was discovered that the appendix was the seat of a carcinomatous growth, sections were made through the portion of the appendix invaginated in the cecum and through the wall of the cecum itself. The sections present a curious appearance. The sections in general show four definite zones: A central cellular area, a wide zone of smooth muscle, beyond which is a second cellular zone, covered by the fourth zone formed by the mucous membrane of the colon. In the centre, corresponding to what should be the lumen and mucous membrane of the appendix, is a solid growth of small, polyhedral cells, arranged in large spaces separated by a delicate or fairly thick, connective tissue stroma. Surrounding this central growth is a wide, circular band of smooth muscle, which evidently represents the muscular coats of the appendix and cecum. In some sections this band is complete and unbroken, while in others it is infiltrated more or less extensively with the cells of the growth. Outside of the smooth muscle ring is the second, cellular zone, which evidently takes the place of the submucosa of the colon. This zone is quite wide, and is made up almost exclusively of irregular solid masses of cells of the newgrowth, which are separated by a connective tissue reticulum. In many places this growth in the submucosa is separated from the mucosa definitely by the muscularis mucosa. The mucosa itself looks thin, the crypts are not numerous, and

the stroma is filled with small, round cells. In other sections the muscularis mucosa has been destroyed, and there is direct connection between the growth in the submucosa and the mucous membrane.

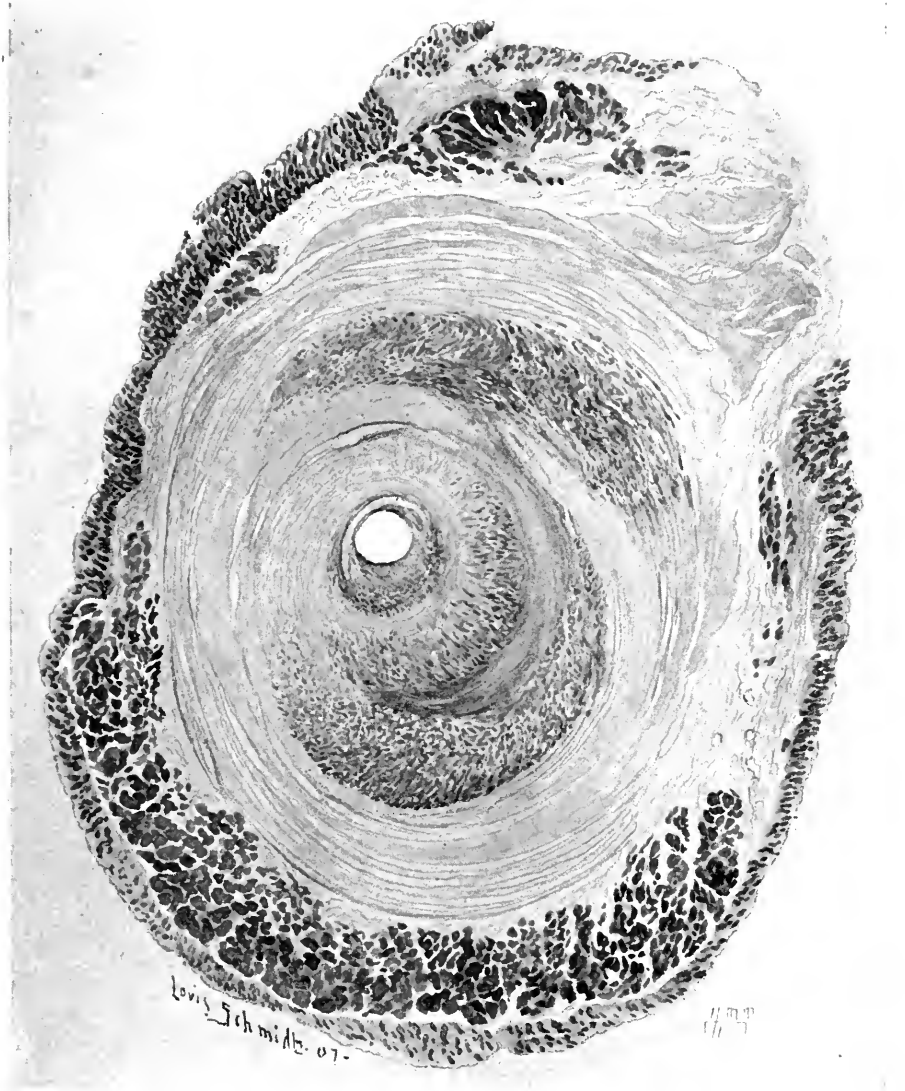


FIG. 2.—Section through invaginated portion of cecum and appendix.

In a few places in the sections comparatively normal crypts of Lieberkühn are seen, but usually replacing the crypts there are irregular tortuous spaces, extending from the surface into the solid growth below, which are partially or entirely filled with the polyhedral cells forming the new growth. The stroma between is edematous and infiltrated with polymorphonuclear leukocytes, small, round cells, and epitheloid cells.

Such sections suggest that the growth may have originated from the glands of the mucous membrane of the cecum, but it is difficult to say whether the growth extends down from the mucosa or up from the more extensively involved submucosa. From the fact that the entire appendix, even to its tip, is the seat of a growth, and from the fact that the mucous membrane of the colon shows a newgrowth in only one or two places where there is a direct connection between the growth in the submucosa, it seems reasonable to suppose that the carcinoma arose from the appendix and involved the cecum by direct extension of the growth.

Diagnosis. Carcinoma arising in the appendix; invagination of appendix into cecum, with extension of growth to that portion of cecum which surrounds the appendix.

The pathological findings were fully discussed with the father of the patient, and after some delay a second operation was agreed to.

June 11, 1907. An incision was made through the right rectus muscle, and the cecum, with three or four inches of the ileum, was resected, including the entire group of ileocolic glands. A lateral anastomosis was made with rubber-covered clamps and Pagenstecher thread. As the mesenteric vessels were ligated as near the back as possible, there was a slight hemorrhage from one of the vessels before it was secured with forceps. This deep removal of the mesentery was done to insure the complete removal of the ileocolic glands. The wound was closed without drainage.

For forty-eight hours after operation the patient was quite ill, with vomiting, distention, and signs of intestinal paresis. The bowels were finally moved, the vomiting ceased, and from then on the recovery was uneventful.

The patient left the hospital at the end of three weeks weighing 113 pounds. Two months after the operation her weight had

increased to 121 pounds, and March 1, 1908, her weight was 129 pounds. Her best weight previous to these operations had been 132 pounds. She is apparently in perfect health.

Pathological Report. The specimen consists of the cecum and about 10 cm. of the ileum. The ileum to the right of the specimen is bound by adhesions to the cecum. The line of junction is covered by a delicate film of connective tissue. The point of excision of the invaginated appendix is entirely hidden. At the point where the ileum and cecum are adherent there are, deep down, firm adhesions. A number of the ileocolic glands and the mesentery are included in the specimen. On opening the intestine a thick, yellowish green material escapes from the ileum. The cecum is filled with the same material. The mucous membrane looks pinkish, soft, and apparently normal. In the deepest part of the cecum is a dimpled scar in which one sees a stitch. At the base of this point the cecum and ileum are adherent, and the adhesions, though not extensive, feel hard. The mesenteric lymph nodes vary from 0.5 to 1.5 cm. in diameter. They are regular but quite firm and white. On section some of them show small, whitish points along the periphery.

Microscopic Examination. Sections are made through the adhesions at the seat of operation, through the ileum and colon above and below the seat of operation, and through eleven of the mesenteric lymph nodes. *At the seat* of the operation the section includes a few of the stitches. The subperitoneal surface of the colon and ileum are adherent. Between these surfaces there is a little blood, fibrin, and granulation tissue. There is a general infiltration with small round cells, epithelial cells, plasma cells, and a few polymorphonuclear leukocytes. About the remains of the stitches there are many foreign body giant cells. The mucous membrane of the colon and the ileum is slightly edematous. The lymphoid follicles are greatly swollen and the germinal centres show hyperplasia. In the mucous membrane of the ileum, and especially of the colon, there are great numbers of eosinophiles. There are no evidences of tumor growth.

Sections through the colon and ileum below and above the operation wound appear normal except for swelling of the lymphoid

tissue. *All the mesenteric lymph nodes* show some swelling of the lymphoid tissue with some endothelial proliferation. Many of the lymph sinuses are dilated. Occasionally they contain many lymphoid cells. In two of the lymph nodes metastases are found. They lie in the peripheral sinuses, localized fairly well in one position. In one gland the metastasis also extends into the sinuses surrounding one follicle. The cells have a gland-like arrangement suggesting very closely the structure of the original growth. The cells are columnar or cuboidal and lie in columns and rows. The protoplasm is granular and the nuclei oval and pale. A few karyokinetic figures are seen.

Diagnosis. No return of growth found at seat of operation; metastases to mesenteric lymph nodes.

The second operation seems to have been fully warranted by the metastases found in the ileocolic glands, and the judgment of the two pathologists who examined the specimen in urging a second operation proved correct. While it was rather anticipated that we would find in the cecum areas of malignancy, particularly at the pin-head sized pearly spot which was noticed at the time of the first operation, yet a careful examination of all the tissue removed failed to reveal any malignancy except in the mesenteric glands.

The sequence of events in this appendix might be explained in two totally different ways: (1) That the epithelial growth was of the character of the small benign tumors sometimes found in different parts of the intestinal tract, and which may be present for long periods of time with very slow growth. Such a tumor through the slow formation of fibrous tissue may have drawn the appendix within the cecum, and after the growth had invaded the walls of the cecum through extension, metastasis to the ileocolic glands followed. In other words, the tumor may have been practically local and latent until the cecum was invaded, when its malignant characteristics developed. (2) That the appendix had been the seat of long-standing chronic disease which recently had undergone malignant change, the operation uncovering it in its early stages. The pathologists, I believe, would rather favor the first view expressed.

FIG. 3.—Section through one of the mesenteric lymph nodes showing metastasis.

DISCUSSION ON THE PAPERS OF DRS. HARTE AND LE CONTE.

DR. WILLIAM B. COLEY, of New York.

I desire to place on record a case of primary carcinoma of the appendix, observed in February of this year, which was in many ways unique. No symptoms whatever related to the appendix had ever been observed. The woman was sent to me for probable malignant disease of the ilium. She was forty-eight years of age, and had had a severe fall, striking on the upper part of the right iliac bone. She developed a swelling in this region and dead bone was removed. The sinus did not heal. She was operated upon a few months later in a Western city and some tissue was removed. Microscopic examination showed it to be medullary carcinoma. She went on in perfect health, but the sinus never healed. When I first saw her in February there was a small sinus on the outer aspect of the ilium reaching down to the bone. An exploratory operation was done by myself, and there was found an opening through the ilium about the size of a lead pencil. Operating further, I came into a cavity about the size of a hen's egg, and curetted away material which was found to be adenocarcinoma, probably of intestinal origin. The case was seen in consultation with Dr. Bull. Right after the operation a fecal discharge occurred, proving that it was of intestinal origin. After consultation it was decided to do an abdominal operation and resect the diseased bowel, which was supposed to be the cecum. The condition proved to be primary carcinoma of the appendix. The appendix was almost entirely destroyed and the whole region of the cecum glued to the inner surface of the iliac bone. I resected the cecum and the ileocolic glands and made a lateral anastomosis, but the patient died four days later of peritonitis.

DR. GEORGE EMERSON BREWER, of New York.

There are two types of carcinoma: One is a very rare type, with metastasis, which acts like carcinoma in any other part of the body. Another type is composed of that large number in which we have a disease apparently perfectly benign, and only recognized by microscopic section after removal of the specimen. I had a case illustrative of the very early stage. There were several attacks of appendicitis, and the appendix removed contained a little hard nodule. Upon section the report was that it was carcinoma. Careful examination of the specimen showed that the section was made over the site of a healed perforation, and in that perforation there was a little curtain of mucous membrane which prolapsed through the opening. Healing had taken place, and the epi-

thelial cells were embedded in this tissue. I think such is probably the origin of many of the cases reported as carcinoma of the appendix.

Dr. A. Vander Veer, of Albany, N.Y.

I have had 5 cases of carcinoma of the appendix, and have seen many cases of chronic appendicitis in young people. The cases of carcinoma did not present any symptoms of malignancy. I think it is a question how far we should make use of this knowledge of the frequent presence of malignancy, and insist upon operation. Many of the chronic cases will not have operation. It would seem that they are running some risk in regard to carcinoma.

Dr. Harte. I should like to ask Dr. Coley the age of his patient. I agree with Dr. Brewer's remarks absolutely, and I think that we undoubtedly have two distinct types of disease occurring in the appendix: one in the younger class of patients, and the other in persons in the cancer zone, where the prognosis is much graver, as there is a distinct tendency to invasion of the surrounding tissue. Many of these patients carry the condition until they reach the cancer zone.

Dr. Le Conte. I agree that there are probably two types of epithelial tumors in the appendix: one type, which the pathologist looks upon more as a benign disease, occurs in other parts of the intestine as well as in the appendix, and is characterized by the smallness of its cells, its slow development, and absence of metastasis. I believe, however, when this type of more or less benign tumor has once encroached upon the cecum, the malignant characteristics rapidly develop. Dr. Brewer's remarks suggest the possibility of a diverticulum in the appendix, with the inflamed mucous membrane around it. Of course in this class of cases the microscopic appearance is very similar to malignancy.

EXPERIMENTS IN FLUSHING THE INTESTINAL CANAL WITH SALT SOLUTION THROUGH MULTIPLE ENTEROTOMY OPENINGS.

A SERIES OF STUDIES ON ANIMALS AND ON HUMAN CADAVERS FOR THE PURPOSE OF DETERMINING WHETHER IT IS PRACTICABLE TO ATTEMPT TO REMOVE A PART, OR THE WHOLE, OF THE INTESTINAL CONTENTS BY WASHING OUT THE CANAL OF THE SMALL INTESTINE THROUGH ENTEROTOMY OPENINGS, SYSTEMATICALLY FROM ABOVE DOWNWARD; AND FINALLY, BY WASHING OUT THE COLON FROM THE LOWEST ENTEROTOMY OPENING, THE CONTENTS OF THE COLON AND WASH WATER ESCAPING FROM THE ANUS.

By GEORGE H. MONKS, M.D.,
BOSTON.

For a number of years I have been much interested in what has seemed to me a useful procedure in certain conditions of the intestines, namely, the immediate removal of an appreciable portion of intestinal contents through one or more enterotomy openings. In an article read before this Association in 1903[1] I suggested the possibility of emptying the intestines through a rigid tube upon which a considerable length of the intestines is *gathered*. Later, I made further experiments upon the cadaver in reference to this procedure, and published them.[2] In many

[1] Intestinal Localization. Annals of Surgery, October, 1903, p. 575.

[2] Studies in the Surgical Anatomy of the Small Intestine and its Mesentery, Annals of Surgery, October, 1905, p. 543.

Note. These experiments were performed at the Harvard Medical School: the animal experiments in the Laboratory of Physiology and the Laboratory

cases, as has been shown by my own experience and that of a number of other surgeons who have kindly communicated their

of the Division of Surgery; the experiments on cadavers in the rooms belonging to the Department of Operative Surgery.

I was not aware that this procedure had ever been used by anyone else until just before I presented my paper at the meeting. At that time Dr. John E. Summers, Jr., of Omaha, called my attention to an article on "Intestinal Paralysis," by Dr. George Haslam, of Fremont, Nebraska, in which article irrigation of the intestinal canal was used in several cases. The reprint of this article, which Dr. Summers kindly gave me, does not state where the article originally appeared, but a footnote says that it is "Part of paper read at the annual meeting of the Dodge County Medical Society, held at Fremont, Nebraska, December 11, 1902." In some of these cases permanent openings were made and the bowel was flushed from time to time after operations; in others the intestinal wounds were sewed up and the bowel returned to the abdominal cavity. One case given at length deserves special mention. The patient was a boy, aged fourteen years, who was "suffering from a severe attack of intestinal paralysis accompanying a relapsing appendicitis." A loop of small intestine, about eighteen inches long, and "as high as possible," was drawn through an abdominal incision. Each end of the loop was opened and the bowel washed out. The "openings were stitched to the extreme end of the incision, the intermediate portion of which was then closed with deep stitches." The stomata were used to flush out the bowels during the first few days after operation. Later, the openings were closed and the bowel replaced in the abdomen. The patient made a good recovery. Dr. Haslam recommends in such cases enterostomy openings "as high as possible," with a good length of bowel between them. He refers to an article by Dr. Edmund M. Pond, of Rutland, Vt. (American Jour. Obstet., 1898, p. 289). Dr. Pond's patient was a girl, aged ten years, suffering with appendicitis and general suppurative peritonitis. From the description given it is evident that the patient was in a desperate condition. The abdominal cavity was thoroughly irrigated, and a distended loop of small intestine, a few feet from the ileocecal valve, was brought into the wound, stitched to it, and incised. Hot saline solution was then introduced into the bowel above and below the incision, and the bowel "thoroughly unloaded." From time to time during the next few days the bowels were irrigated through the fistula. The patient ultimately recovered. Dr. Pond was, apparently, the first surgeon to make use of irrigation of any kind for the purpose of cleansing the bowels.

Had I known of these cases earlier, I should have been glad to incorporate them in my paper. As it is, however, I am obliged to place them in a footnote. It is gratifying to learn of the success which attended irrigation of the bowel in these cases of Drs. Haslam and Pond.

From the accounts given of these cases, however, I do not understand that any attempt was made to wash from above downward, or to cleanse systematically the whole of the small intestine, or even a large part of it, and furthermore no mention whatever is made of cleansing the colon.

After my paper had been read at the meeting, my attention was called to the

results to me, this procedure is quite sufficient to relieve the intestines by removing a large part of their contents.

I have long had the feeling, however, that in certain critical cases of acute intestinal toxemia, in which the patient's life is threatened because of it, something more may be needed. It has also seemed to me that if a method could be devised by which the intestinal canal, or even a portion of it, could be cleansed by washing with warm salt solution without causing thereby fatal shock or peritonitis, a useful procedure might result—a procedure which would accord with a correct surgical principle, viz., the immediate and thorough removal of at least one of the principal causes of the patient's illness.

Now, while a straight canal, if not too long, can easily be flushed from one end to the other by a steady flow of salt solution, such a procedure in a tortuous canal like the human intestine is practically impossible. Even if this could be done, the force required to do it and the resulting tension within the intestine would be so great as probably to cause injury to the wall or attachments of the gut, or even a rupture.

While thinking over this subject it occurred to me that it might be worth while, in the experiments which I purposed to make, to determine, so far as I could, whether the intestinal canal could be cleansed with comparative ease and safety, not by attempting to flush the whole bowel at once, but by flushing it section by section. It also seemed obvious to me that, to flush the intestinal canal properly, the flushing should be carried out from above downward, or, in other words, that the irrigating fluid should be introduced into the intestinal canal through an enterotomy wound high up in the gut, and that, after traversing the section of gut just below,

following statement in Keen's Surgery, vol. iii, p. 777: "Kocher opens high in the jejunum and low in the ileum, washing the gut through and through and closing the openings at the termination of the irrigation." I have not been able, however, to find the original article, in which Kocher describes this procedure. I also fail to understand how the human intestine can be flushed from one opening high in the jejunum to another low in the ileum without causing very dangerous pressure within the gut. In a number of experiments on the cadaver I found this procedure practically impossible.

it should be allowed to escape from a second enterotomy wound at the lower end of that section, and that later the second section of bowel should be flushed in the same way, that is, from above

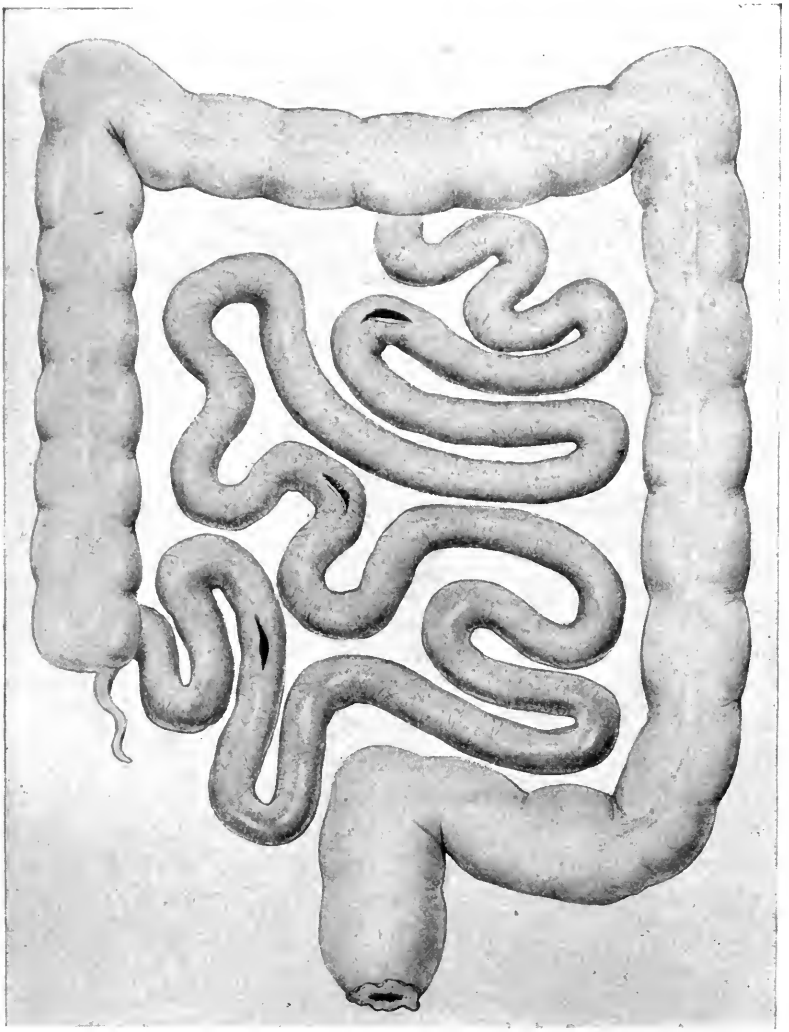


FIG. 1.—A diagram to illustrate a method by which the intestinal canal may be flushed. In this diagram three enterotomy wounds are shown. The number and position of the enterotomy wounds would naturally vary with the case.

downward. A glance at Fig. 1 will make clear this division of the small intestine into sections, the first section being between the first and second enterotomy wounds, and the second section between the second and third. This diagram is intended only to illustrate the principle on which flushing may be done. The number and position of the enterotomy wounds would naturally vary with the case.[1]

FIG. 2.—Showing on the cadaver the method of determining the real direction of the gut by passing the thumb down one side of the mesentery, and the fore and middle fingers down the other, in the direction of the mesenteric root. If the whole of the cadaver were shown, its head would be on the left side of the illustration.

Now, in the human cadaver, in order to cause the irrigating fluid to flow downward in the bowel—and not upward—it is necessary for the surgeon first to determine with certainty the *real direction* of the bowel in any loop of gut which he proposes to incise. This can be determined with certainty, provided the abdominal wound

[1] The systematic irrigation of the intestinal canal here suggested was planned for the purpose of experiments on cadavers and on animals, in which no pathological obstruction was supposed to exist. It is, of course, obvious that no attempt should be made on a patient with mechanical obstruction to irrigate that part of the bowel in which obstruction exists, or to do so even after the obstruction has been removed, if there is reason to believe that the wall of the gut has been weakened.

is large enough to allow palpation of the mesenteric root. For the purpose of explaining this method in detail I take the liberty of introducing Fig. 2, which has already appeared in one of the articles already referred to. A loop of intestine is gently drawn out of the wound by the surgeon. The assistant, grasping the two ends of this loop, holds it suspended vertically from the wound. The surgeon, putting his thumb on one side of the loop and his fingers on the other, causes them gently to proceed down

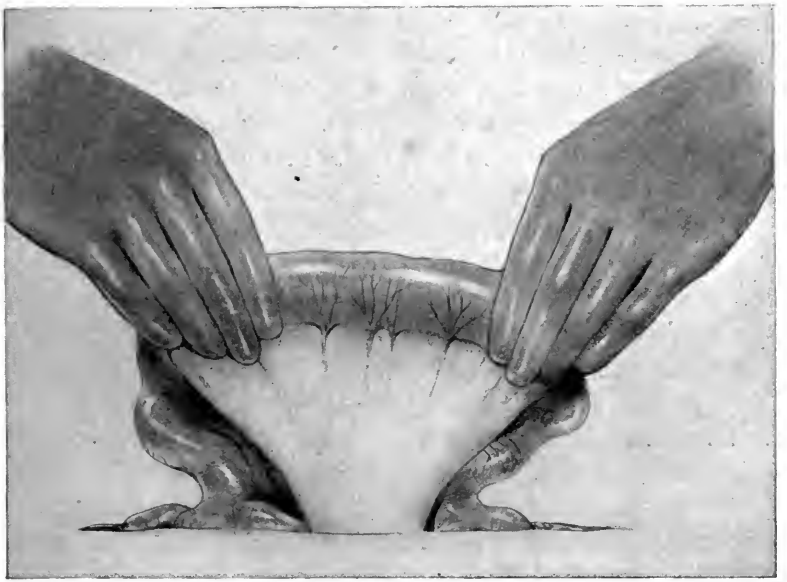


FIG. 3.—The loop of bowel is being held upward by the assistant. The thumb and fingers would in this case proceed to the root of the mesentery down the constricted pathway in the middle probably without encountering any twist.

the mesentery toward the right side of the spine—in other words, toward the root of the mesentery. Fig. 3 shows the narrow pathway in the deeper part of the mesentery down which his thumb and fingers must proceed in order to reach the mesenteric root. If he finds a twist in the mesentery—a condition easy to detect—he withdraws his hand and turns the loop of bowel in such a way that the twist is removed. His thumb and fingers are then

pushed again down the mesentery, in the same manner as before, toward the mesenteric root. If there is then no twist in the mesentery the surgeon knows that the proximal end of the loop lies at the upper end of the wound and the distal end of the loop at the lower end of the wound. In this simple manner he learns what is the real direction of the gut, and, therefore, the direction in which the irrigating nozzle should be placed in the bowel. Simple as it is, however, it is hardly likely that one can successfully carry out this procedure on the living subject until one has tried it —in fact, practised it—on the cadaver.

With the idea of testing, so far as I could, the practicability of flushing the canal of the bowel, section by section, I carried out during the last two years at the Harvard Medical School a series of experiments on animals and human cadavers. In all of them I was assisted by Dr. William E. Faulkner, and it gives me pleasure here to acknowledge his kind and helpful services. I beg to thank also Professors W. T. Porter and W. B. Cannon for having placed at my disposal for a part of the animal experiments the necessary laboratory facilities.

STUDIES ON ANIMALS.[1] I carried out the procedure referred to on fifteen cats. Although the technique of the operations on these animals varied somewhat, the essential features were approximately the same in all. The anesthetic used was ether.

The hair upon the abdomen was removed by a depilator, and the skin cleansed and sterilized. The abdomen, having been freely laid open and the coils of intestine brought outside of the abdominal wound, the gut was incised on its free border at a point near the upper end of the jejunum. A small glass tube was then

[1] My reason for beginning these experiments on animals rather than on human cadavers was principally because of the fact that the intestinal canal is much simpler and shorter in cats (the animals which I purposed to use) than in human beings, and I wished first to try the effect of this procedure (flushing the intestinal canal) under conditions which seemed most favorable before proceeding with what I knew would be (mechanically, at least) more difficult, namely, flushing the intestines of human cadavers. In connection with these experiments on cats I had also, of course, the great incidental advantage of observing the immediate and remote effects of the operation on living animals.

introduced through the enterotomy wound, and this tube, having been pushed well into the lower arm of the gut, was held or tied in position, after which the gut below the opening was gently filled with warm salt solution to a point just above the ileocecal valve. At this point there was made another opening in the gut, and much of the salt solution which had already been injected into the gut through the upper opening was allowed, mixed as it was with intestinal contents, to escape through the lower one. More salt solution was then introduced through the upper opening, and, of course, more wash water, mixed with intestinal contents, escaped from the lower opening, or through a glass tube which had been previously inserted into it. About one pint of salt solution was thus passed through the gut, the reservoir being held from one to three feet above the body of the animal. The length of intestine between these two openings was three to five feet, according to the length of the animal's bowel. The upper intestinal wound was then sewed up and carefully cleansed, and all of the bowel which had been flushed, except that part in which the lower intestinal wound was situated, was returned to the abdominal cavity. In a few cases the lower intestinal wound was then sewed up, and the loop of bowel cleansed and returned to the abdomen. In the other cases—the most recent ones—the colon also was flushed from the lower intestinal wound through to the anus. This was accomplished by inserting the glass tube, directed downward, into the lower enterotomy opening, and allowing warm salt solution gradually to flow into and distend the colon. After this an exit tube was inserted into the anus and the bottle held a little higher. The result was that the wash water, mixed with fecal material, finally ran out through the anal tube. This washing was continued until the salt solution came away clear. The second enterotomy wound was then sewed up and the abdomen closed without drainage. Naturally, much of the fluid which had been injected into the bowels still remained there.

It is hardly necessary to say that in all of these cases the greatest care was taken to avoid contamination of the peritoneum by the intestinal contents. During the manipulations those parts of the

bowel in which were situated the enterotomy openings were drawn well toward the operator, and from the time when the first incision was made until the suturing was complete they were kept carefully isolated from the other parts, partly by gauze, but in the latter cases by means of superimposed sheets of rubber dam.

This method of using rubber dam proved so useful to me in these experiments that I give it here in detail. It seems to me not unlikely that it may be of practical value during operations on the human subject; in fact, I have myself used it, with advantage, in a number of abdominal operations:

A piece of thin sheet rubber about one foot square—on the human subject it should be eighteen inches square—properly sterilized, and moistened, with a small slit made at or near its centre, was laid over the laparotomy sheet in such position as to bring the slit in the rubber dam directly over the abdominal wound. The small intestines were then gently lifted out through the abdominal wound and made to rest upon the rubber dam. Another sheet of rubber dam, also sterilized and moist, was then laid over them. Two little slits were then cut in this second rubber dam, and through them were gently drawn the two loops of intestine —naturally one belonged to the upper part of the gut and the other to its lower part—in which were to be made the two enterotomy openings. Though most of the intestinal coils were outside of the abdominal cavity, nevertheless they lay between two sheets of rubber dam, where they were kept moist and warm and protected from injury and infection.

Of the fifteen cats operated on, five died and ten lived. *Cat No.* 1 died four weeks after the operation, but no definite cause for death could be found at the autopsy. The wounds in the intestine were solidly healed and there was no sign of peritonitis. *Cat No.* 4 died eleven days after the operation. At the autopsy the upper wound in the intestine was found firmly healed. The lower wound, however, was in the middle of a large, suppurating area (*peritonitis*), in which several coils of intestine were included. The stitches in the enterotomy wound had evidently given way, for the wound was open, thus permitting the escape of intestinal

contents into the peritoneal cavity. *Cat No.* 6 died three weeks and one day after the operation. The autopsy showed that the cause of death was *peritonitis*, and both wounds were open. It is likely that the peritonitis was due largely, if not wholly, to the fact that, intentionally, no attempt had been made in this case to approximate the serous surfaces of the bowel, the intestinal wound having been united by a simple over-and-over suture. The method was used here for the reason that it had been successfully tried in the preceding case. The two other fatal cases were *Cats No.* 10 and *No.* 12. Both of these animals died during operation —presumably from ether. Of the five cats, then, which died, the cause of death in two was presumably etherization; in one it was not discovered, while in the other two it was peritonitis resulting probably from technical errors, which had no necessary connection with the principle under investigation. None of the three cats which survived the operation was at any time after it in good condition. All three were evidently very sick, and from the time of the operation they took little or nothing in the way of food.

On the other hand, the ten cats which survived seemed to regain their former condition of health and activity within one to three days after operation, and they ate their usual amount of food.

Autopsies were done on these ten cats at the following times after operation: at six days (2 cats); at eight days (1 cat); at thirteen days (1 cat); at eighteen days (1 cat); at twenty-one day; (1 cat); at twenty-six days (1 cat); at thirty-two days (1 cat); at thirty-three days (1 cat); and at thirty-five days (1 cat). The animals were killed by etherization or by the use of gas before these examinations were made.

Barring the fact that in a few cases the abdominal wound did not heal by first intention throughout, nothing pathological was discovered at any of these autopsies, and the condition of the abdominal contents was quite normal except for the presence of the firmly healed intestinal wounds and a few adhesions. The intestinal sutures (iron-dyed silk), partly disintegrated, were in some of the cases in the process of being thrown off from the wounds into the lumen of the gut.

From these experiments one is, I think, justified in stating (1) that it is mechanically possible, from an abdominal wound in a cat, to flush with salt solution the greater part of the small intestine through an opening in the upper part of the jejunum, to a second opening in the lower part of the ileum, and then to flush the large intestine from this second opening, the intestinal contents and wash water escaping through a tube previously inserted through the anus into the rectum; (2) that it is possible to do this in the majority of cases, if not in all of them, without causing sufficient shock to kill the animal; (3) that it is possible to do this without peritonitis resulting, provided, of course, that the operative technique is without error; (4) and that it is probable the animal will regain, in the usual time after an abdominal operation, its former condition of health and activity.

STUDIES ON CADAVERS. I next tried to flush the intestinal canal of human cadavers with the same technique I had used in the cats, but I soon found, as I had expected, that the problem in the human body is a much more complicated one. While in a cat the small intestine is short, of small caliber, thick walled, and comparatively simple in the disposition of its coils, that of the human being is very long, of large caliber, thin walled, and very complicated in its arrangement.

With the abdomen of the cadaver wide open I attempted to flush the intestines, by sections, from the upper part of the jejunum down. On the whole, this attempt was successful, though I found that, in order to do it satisfactorily, more openings in the intestine were required than were necessary in the animal experiments. The great length of the intestine, the complicated arrangement of its coils, and the occasional presence of masses of solid or semi-solid feces in the colon presented obstacles to the onward flow of the water, though a gentle manipulation of the distended coils usually sufficed to remove the obstruction and to allow the fluid to proceed down the intestinal canal. The technique was essentially as follows:

The abdomen having been freely laid open from ensiform cartilage to pubes, the presenting intestinal loops were lifted out

of the abdominal cavity, and an incision was made into the jejunum as high up as possible. A large glass tube was tied into the opening thus made, and water, gradually introduced through the tube, was allowed fully to distend as much of the intestine below the opening as possible. After this the intestine was opened lower down and another tube—this one for exit—was tied in place. The portion of intestine to be cleaned was isolated from the rest of the bowel, either by clamps or by the ligatures used for holding the tube in place, or by hand pressure. The fluid which entered the intestine through the upper tube coursed down the intestinal canal and came out through the lower tube, carrying with it most of the intestinal contents. When the wash water was clear, the upper tube was removed and the intestinal wound sewed up. The second segment of intestine was then flushed in the same way as the first one, the exit tube for the first segment of bowel being replaced and used for the *flushing tube* of the second.

This process of irrigating the small intestine, section by section, and sewing up the enterotomy wounds when they were no longer needed, was continued until nearly the whole of the small intestine had been flushed and its contents largely removed. It was necessary to make at least three openings in the gut—sometimes four or five—in order to wash out the gut in its whole length. From the lowest enterotomy opening the attempt was then made to flush the rest of the small intestine and the colon. As a rule, this was successful, though, as I have already said, the presence in the colon of solid or semisolid feces sometimes made this process difficult. Finally, the last enterotomy opening was sewed up and the abdomen closed.

In order to determine whether a change of posture would make any difference with the ease with which the intestines could be washed out, I tried several of these washing experiments, with the cadaver in different positions. While the distended loops of an inverted cadaver—the intestines hanging from the open abdominal wound—could be washed out rather more easily than those of a cadaver lying on its back, the difference was not especially marked. The other positions tried, viz., elevated head,

elevated feet, one side or the other uppermost, etc., showed no appreciable difference in the ease of flushing the bowel.

As a result of these and many other similar experiments in flushing the intestinal canal of human cadavers, I reached the following conclusions:

1. That it is possible in most cadavers to flush the entire intestinal canal, *by sections*, from the upper part of the jejunum through to the anus, provided that the abdomen is freely laid open from ensiform cartilage to pubes, and also provided that, as already explained, there are made in the intestine a sufficient number of openings.

2. That it is possible in most cadavers, through an incision from umbilicus to pubes, to flush either the lower part of the small intestine only, or the lower part of the small intestine and the colon in addition.

After I conducted a number of these experiments on animals and cadavers, it seemed to me that gently to flush the intestinal canal of a patient suffering with acute intestinal toxemia was a practicable procedure, and that, after the simpler methods had been used without result, it was a thoroughly justifiable one. It also seemed obvious that after the escape of intestinal contents, which would naturally take place through the enterotomy wounds—especially when a long evacuating tube is used—a careful washing of the intestinal canal with warm salt solution would be of great advantage to such a patient, especially for the following reasons: (1) because it would cleanse a region which was the source of poisonous infection; (2) because it would leave within the intestinal canal a large quantity of salt solution where it would be absorbed into the circulation, and thus improve the pulse; (3) because the warmth of the solution left in the bowel would probably help to resist shock. For these reasons I felt willing to carry out this procedure on a patient, provided the conditions which the patient presented seemed to me to justify it.

Case. Finally a case, for which the treatment outlined above, or some modification of it, seemed especially suitable, entered my service at the Boston City Hospital. This case has already

been published in full,[1] but as some reference to it seems to be called for in connection with the experiments which led up to it, I give here a brief abstract.

The patient was a little girl, aged eight years, whose condition (the result of streptococcus peritonitis, and probably also intestinal toxemia) was deplorable. The case was one of a class that surgeons dread to see. She presented the symptoms of an extreme degree of septicemia, or toxemia, and a fatal result within a few hours seemed inevitable. A median incision from umbilicus to pubes opened the abdominal cavity. There was free pus everywhere, and to the reddened intestines many thick, yellowish flakes of fibrin were adherent. Exploration showed no obvious cause of peritonitis, though, as the appendix was somewhat swollen and injected, it was removed. The peritoneal cavity was thoroughly irrigated through a glass tube. A loop of intestine near the upper end of the wound[2] was drawn out and the real direction of the intestine comprising it determined.

An incision was then made in this loop, and a long glass tube, with its tip directed downward, was introduced into the bowel through the intestinal wound. During this process much gas and a small amount of intestinal contents were removed. A gauze pad held by the hand firmly around the intestine kept the tube in place and prevented leakage. Warm salt solution was then allowed gradually to flow into and distend the intestinal canal, and a second enterotomy opening was made in the lowest intestinal loop which presented in the wound. Much foul-smelling gas and intestinal contents escaped from this second opening, but finally the wash water came out clear. The upper wound was then stitched up, and the tube was inserted into the lower wound, with its tip directed downward. A large amount of salt solution was introduced which fully distended the rest of the small intestine and colon, and the lower wound was then stitched up. The

[1] Boston Medical and Surgical Journal, June 20, 1907, p. 809.

[2] By an oversight in the original report of this case the impression was given that this loop was near the duodenum, whereas it was, in truth, probably in the lower half of the intestine.

peritoneal cavity was again irrigated, a small drain placed in the pelvis, and the abdomen closed. The greatest care was taken during the operation to avoid contamination of the peritoneum. After the dressing had been placed on the wound a rectal tube was introduced and nearly a quart and a half of fluid, containing much fecal material, removed through it.

The change in the patient's pulse during the operation was so marked as to call for special mention. While before the operation it was "thready" and registered 180 beats to the minute, it became much stronger during the flushing of the intestine, and dropped to 140. The patient's general condition was correspondingly improved. On being put back to bed, she soon rallied from the effects of the operation, and finally got well.

REMARKS. As a result of the experiments described, and also because of the recovery of the patient in the case just referred to, I am strongly inclined to the belief that the procedure has in certain cases a distinct sphere of usefulness.

It seems to me that when a patient's life is in danger because of acute intestinal poisoning, associated with great distention of the bowels, and the time has passed when the ordinary methods seem likely to be of use, when the temperature is high and the pulse rapid and weak, there is in such a case a fair possibility that the immediate removal through enterotomy openings of a part of the intestinal contents, and flushing the gut with a quantity of warm salt solution, from one opening to another, may, at this critical period in his illness, turn the scale in favor of the patient, and thus save his life. I have suggested carrying out this procedure through multiple openings in the intestine, for the reason that, in my opinion, it can be done more thoroughly in this manner. It is, of course, possible that, even if done through only one opening, the procedure may still be sufficient to be of material assistance to the patient. Apparently, the co-existence of peritonitis does not contra-indicate the procedure.

It is quite possible that for various reasons the technique of this procedure is easier in a child than in an adult. However, I see no reason to prevent its performance in the adult, at least in part,

provided great care is taken. Care must also be taken, as already mentioned, in cases in which there is, or has been, a mechanical obstruction of the bowel, or in which for any cause its walls are greatly weakened.

As for the technique of the procedure of flushing the intestinal canal I venture to make the following suggestions:

1. Make a free opening through the abdominal wall in the median line, the incision reaching from the pubes to, or above, the umbilicus.

2. Pick up a loop of bowel high up in the wound.

3. Determine by reference to the root of the mesentery which is really the upper and which the lower end of this loop. This determination is essential, if one wishes to know in which direction the salt solution will flow during the process of flushing.

4. Make an enterotomy wound in the loop. Allow gas and feces to escape, and insert the tube into that arm of the loop which leads in the direction of the ileocecal valve; in other words, insert the tube pointed downward into the gut.

5. Allow warm salt solution gradually to distend a few of the loops below this opening. If nothing more than this is done in the way of washing, it seems to me that the substitution in the bowel of the warm salt solution in place of the gas and feces that have escaped will presumably help the patient.

6. If the patient's condition will allow it, pick up the loop which is apparently the lowest of those distended, make a second opening, insert a second tube—this one directed upward—and allow the wash water to run out through the tube until it becomes clear.

7. Carefully cleanse and sew up the first enterotomy wound, and return to the abdomen that part of the bowel which has been washed out. In fact, as soon as any enterotomy wound is no longer needed it should be cleansed and sewed up, and the loop of bowel which has been sutured should be returned to the abdominal cavity.

8. Repeat this procedure as many times, consistent with safety, as may seem necessary, each time isolating and cleansing a segment of intestine lower down.

9. Finally, if the patient's condition will permit further operating, fill the colon with salt solution from the lowest enterotomy opening, and insert a rectal tube to remove any wash water or intestinal contents which may reach the rectum. It is well to insert the rectal tube before attempting to close the abdominal wound, and thus make it easier, by removing some of the wash water in the colon, and diminishing its size, to bring together the edges of the wound.

10. Use great gentleness in all manipulations, and carefully avoid contamination of the peritoneum. The method already described of protecting the intestines between two layers of rubber dam bids fair to be of real service.

11. In the event that peritonitis is also present, the peritoneal cavity should be washed out thoroughly, *before* flushing the intestinal canal, and also *after* it.

In closing, I wish to repeat that I do not consider flushing the intestinal canal to be a substitute, in all cases, for tubage of the intestine, or even for ordinary enterostomy. Flushing would seem to be called for only in the most desperate cases—fortunately occurring less frequently, as time goes on—in which the bowels are greatly distended, and in which the patient, overwhelmed as he is with septic or toxic products, will die unless immediate relief is afforded.

DISCUSSION.

Dr. John E. Summers, Jr., of Omaha, Neb.

This operation seems to be a new one in the East. In 1901 it was recommended in the West. Since then I have used it four or five times, and some of my friends use it. Dr. Pond, of Rutland, Vt., recommended, in 1898, a simple incision and an artificial anus; and later wrote a paper about flushing out the bowel in the way Dr. Monks advises. It is a good practice, but we now get hold of cases early and seldom require such technique.

Dr. John C. Munro, of Boston.

My impression is that opening the jejunum high up and making a second opening in the ileum below, and thus washing from above downward, was advocated by Kocher some years ago.

Dr. J. M. T. Finney, of Baltimore.

One of my colleagues and I have reported a number of cases treated as Dr. Monks has described; not, however, by multiple incisions; but since that time we have made use of multiple incisions in the attempt to wash out the intestine. If we could only get, in this part of the country, our cases of gangrenous appendicitis within the forty-hour limit, as Dr. Murphy seems to be able to manage, our results would be much better. In these cases of great distention of the bowel the procedure suggested by Dr. Monks is necessary. I left 2 cases in my ward in the infirmary whose lives I am sure were saved by enterostomy. In 1 case two incisions were made. Both patients were in good condition when I left Baltimore a few days ago. I believe that this operation has a definite and distinct place in surgery. I was much interested in the use of the rubber dam spoken of by Dr. Monks, and had the opportunity of seeing him demonstrate its use a few days ago in Baltimore. I believe it is a distinct addition to our armamentarium, and I take pleasure in using it.

Dr. Joseph Ransohoff, of Cincinnati.

I should like to ask Dr. Finney what were the conditions requiring operation in the 2 cases he now has.

Dr. Finney. Both cases were cases of acute gangrenous appendicitis beyond the forty-hour limit—a good deal beyond. In both cases the intestines were very much distended. The whole abdomen was full of pus, or, rather, of fibrin. The under surface of the liver was as if it had been coated with a coat of white paint. Everywhere there was

exudate, fibrin, and pus. The intestines were distended and atonic. There was a general diffuse peritonitis, with marked distention of the intestinal coils.

Dr. Richard H. Harte, of Philadelphia.

I should like to ask Dr. Finney whether there was much escape of fecal matter observed in his cases.

Dr. Finney. In one case there was fecal matter. There is always a certain amount of thin fecal matter in these cases.

Dr. Harte. I think we all run across these cases, in which there is such ballooning, that as soon as an opening is made the intestines are driven out of the abdomen. The question is practically one of relieving flatus, which is the most important point. I use an instrument resembling a silver catheter, with which I make an opening in the intestine and then carry it up. I got the idea from Dr. Monks in a paper which he read before this Association.

Dr. Monks. My object in reporting these experiments is not to suggest a substitute for enterostomy, or for tubage of the intestine, *in all cases* in which it is desirable to unload the bowels by surgical intervention, for both of these procedures have proved beyond a doubt their usefulness in suitable cases. Moreover, both of them also permit a certain amount of irrigation of the canal; in fact, in the case referred to in my paper, I used the long tube, and, if my memory serves me right, I also in that case gathered up a good bit of the intestine over the end of the tube before attempting to wash through it. The cases in which a more thorough washing may be called for are, it seems to me, those desperate ones—now, fortunately, less often seen than formerly—*in which the patient is profoundly toxic*, and in which the relief afforded by an ordinary enterostomy, or even by tubage alone, will probably not come soon enough or be complete enough to save his life. These points are, however, more fully considered in my paper, of which the communication just read is only an abstract.

It is gratifying to learn of the success of this procedure, or even of modifications of it, in the hands of others. I was not aware until just before I read my paper that it had been used before. There is a good deal of difference, however, between irrigation through one opening in the bowel and systematic irrigation through several openings; between irrigation of a small part of the bowel and irrigation of a large part, or the whole of it; and, finally, between leaving the wounds open permanently and closing them at the end of the operation.

CONGENITAL IDIOPATHIC DILATATION OF THE COLON.

(HIRSCHSPRUNG'S DISEASE.)

By J. M. T. FINNEY, M.D.,
BALTIMORE.

THE subject of this paper is a boy, aged nine years, of Jewish parentage. He was admitted to the Union Protestant Infirmary, April 26, 1906, referred to me by Dr. Frank A. Smith. He came into the hospital complaining of chronic constipation and abdominal pain and swelling. His family history was negative, there being no record of any similar case, so far as is known.

Previous history was of no special interest, except as relates to his present illness. He had had measles and chickenpox, and, aside from the fact that he had always been thin, and his appetite fairly good, no other information could be elicited. His mother stated that from his earliest infancy, beginning immediately after birth, he had always been constipated, and that the abdomen had been unusually large. His bowels have never moved normally, always necessitating a cathartic or enema, or both. He would frequently go three or four weeks without a movement. During these times he would have periods of severe abdominal pain, cramp-like in character. After the bowels began to move, the pain would be relieved. He would have several attacks of this extreme constipation during the year, and great difficulty would then be experienced in producing a movement. At these times, the abdomen would become enormously swollen. Under ordinary circumstances, he would have a movement once or twice a week, and

the abdomen would be somewhat less distended. The stools were putty-like in character, and the odor very offensive. He has had all sorts of treatment from many doctors, but relief has been only temporary.

Upon examination, the patient is found to be a boy rather undersized; mucous membranes pale; tongue clean. General expression not very bright. The whole body, except the abdomen, thin and emaciated. Ribs very prominent. The costal angle very wide. Chest much larger at the base than apex, the costal margins flaring out to such an extent that they are almost horizontal instead of vertical. Movements of the chest rather limited. Lungs clear on auscultation, but the pleural cavity somewhat encroached upon by the pushing up of the diaphragm, due to the abdominal distention.

Heart normal in size, apex slightly higher. Heart sounds clear.

Abdomen very full and prominent, the overlying skin dull and leathery in appearance, and somewhat tense. Superficial abdominal veins quite prominent. Circumference of chest through the plane of the nipples, 54 cm.; of abdomen over the most prominent part, which was at the epigastrium, 65 cm., through the plane of the anterior superior spine, 54 cm. Distance from umbilicus to symphysis, 13 cm.; to tip of xiphoid, 17 cm. Liver dulness considerably diminished. The distention of the abdomen is not quite symmetrical: there is to be seen a crescentic enlargement extending from the left iliac fossa upward to the costal margin, then across the abdomen to the right hypochondriac region, where it gradually disappears. The right iliac region is slightly less distended than the rest of the abdomen. At times, very marked peristaltic waves can be seen traversing the abdomen. The wave seems to travel from right to left, about once in five minutes. The patient complains of no pain during contraction. On palpation, no tenderness, and no masses are to be felt anywhere. The abdominal walls seem unusually thin. The intestinal coils may be felt very distinctly during the passage of the peristaltic wave. No movable dulness was observed. Now and then, loud borborygmi could be heard.

Rectal examination was negative. Attempts were made for

a fortnight to reduce the abdominal swelling by the aid of frequent enemata and cathartics, with only partial success. Large quantities of fecal matter were removed in this way.

It was determined then to make an exploratory incision and perform a colostomy. Consequently, on May 10, under ether anesthesia, the abdomen was opened. An enormous dilatation of the colon was found filling up practically the whole abdomen, with the exception of the right iliac fossa. The dilatation began abruptly at the hepatic flexure of the colon, involving the transverse and descending portions of the colon and the entire sigmoid, with the exception of the last two or three inches, where it as abruptly ended. The rest of the intestinal tract, including the rectum, was normal. The greatest dilatation was in the region of the sigmoid, in places 14 cm. in diameter. The walls of the bowel were much hypertrophied, apparently two or three times the normal thickness. Pigmentation of the hypertrophied portion was also observed. The mesosigmoid was elongated and enormously thickened, in places as much as 2 to 3 cm. The vessels were much larger than normal, as were also the lymphatic structures, especially the lymphatic glands, some of which were as large as almonds. The hypertrophy of the intestine began and ended abruptly, with no signs of kinking or obstruction of any sort. A portion of the thickened mesentery, including one of the enlarged glands, was removed for examination. The intestine was filled with fecal matter and gas. It was decided to perform a colostomy, and the colon at the hepatic flexure was sutured to the parietal peritoneum, through a small incision made over that point. The abdominal wound was then closed. After forty-eight hours the colon was opened and the bowels irrigated through this fistula from above downward, and through the anus, from below upward. Large quantities of yellowish, pasty feces, containing many pinworms, were removed. A small section of large rubber drainage tube was inserted into the fistulous opening in order to insure its patency. This artificial anus was kept open for nearly six months, during which time the patient remained in the hospital, and the bowel was frequently irrigated.

Great improvement in the boy's general condition was observed. He gained weight and strength, and the swelling of the abdomen was markedly reduced. Most of the fecal matter was discharged through the fistula, but some continued to accumulate in the dilated portion of the colon. It was then decided to attempt to short circuit the dilated portion of the colon, or to excise it, as seemed best at the time. Accordingly, on October 23, under ether, the abdomen was opened through a mid-line incision. It was then found that the dilated portion of the colon, described above, had become greatly reduced in size since the establishment of the fecal fistula. The mesocolon and the glands had also shared in this reduction. Since there was found to be room to make an anastomosis between the ascending portion of the colon and the lower portion of the sigmoid flexure, it was decided to do this. It was accomplished by a lateral anastomosis. The colocolostomy having been completed satisfactorily, it was decided, on account of the patient's condition, that it would be safer to postpone the resection of the dilated portion until a subsequent operation.

The boy made an uninterrupted recovery. Meantime, the irrigations were kept up through the artificial anus, which had been left patent. The boy's condition improved so much that his parents decided to take him home instead of having the operation completed. He remained home for another five months, when he reëntered the hospital, having noticed, of late, some return of the abdominal distention. I then advised that the dilated portion of the colon be removed, which was done March 21, 1907, under ether anesthesia. An incision was made through the left rectus muscle, a number of adhesions from the former operations were freed, and the bowel exposed. The ends of the dilated portions of the colon were ligated and inverted by a purse-string suture, and the entire dilated segment excised, the mesocolon being ligated in sections. The previous colocolostomy was found to be in excellent condition, and was left undisturbed. No attempt was made to cover in the raw surface of the mesocolon. Little or no hemorrhage or shock attended the operation, and the patient made a good recovery, with the exception of a phlebitis in the left internal saphenous vein.

The artificial anus, which had been left open from the beginning as a safety valve in case of need, was subsequently closed under cocaine; and the patient has remained well up to the present time. He is now in excellent condition, apparently a normal boy in every respect, except that the costal angle is still rather wider, and the costal border more prominent, than normal.

Although the classical description of this disease given by Hirschsprung, at the meeting of the Berlin Congress for Children's Diseases in the year 1886, first brought its existence to the general attention of the profession, still the condition had been recognized by a number of observers before this time, and cases had been observed and recorded. The earliest reported cases to be found in the literature are those of Parry, in 1825, and Billard, in 1829. Parry's case was a male adult, who had suffered from digestive disturbances for years. Autopsy showed an enormously distended colon, containing an immense quantity of feces. No obstruction could be found anywhere in the alimentary canal. Billard, according to Löwenstein, in 1829, reported the autopsy findings of a six-day-old boy, the lower part of whose small intestine, together with the whole colon, was thickened and sclerosed. In 1836 Ebers, in an autopsy report remarkable for its clear and full description of the pathological conditions present, describes another undoubted case.

Von Ammon, in 1842, described a dilatation of the large intestine and rectum in a child shortly after birth, and recorded another observation in a fetus at about the seventh month. It is a curious fact that these observations, having such an important bearing on the etiology of the disease, should have been noted so early, and that so few similar conditions have since been reported. Then come the reports of Oulmont, 1843; Banks, Bunfer, and Favalli, 1846; Little and Galloway, 1850; Gay, in 1854.

Henock, in 1861, gives a description of a fairly typical case in a young boy. In 1867 the first case was reported from this country by Lewitt, of Chicago. This was followed three years later (1870) by Jacobi, who reported a doubtful case of abdominal loop formation with fatal kinking of the intestine. Then followed the reports

of Barth, Peacock, Gee, Bristow, Morris, Fütterer, Middeldorf, Cheadle, Gaume, and others. Then appeared the first report of Hirschsprung, just referred to (1886). He has supplemented this with three additional reports, four in all. Following Hirschsprung, the literature upon this subject has become very voluminous; no less than 206 communications have been found by Dr. W. A. Fisher, whom I have to thank for valuable assistance in the preparation of this paper. Of the later articles, those deserving especial mention are by Formad, Marfan, Mya, Treves, Griffith, Concetti, Fenwick, Osler, Fitz, Richardson, Escherich, Frommer, Duval, Kredel, Cheinisse, Perthes, Bing, Pfisterer, Danzinger, Löwenstein, Ito, and Soyesima.

With few exceptions, owing to their inaccessibility, or otherwise, every article upon the subject has been read by Dr. Fisher or myself, and the cases studied and tabulated. It was, at first, intended to give a complete statistical report of every case up to date. After the expenditure of much time and effort, however, this idea was abandoned as unprofitable, owing to the fact that, in so many instances the cases had been so imperfectly reported, it was impossible to determine with any degree of accuracy whether or not they really were cases of Hirschsprung's disease. This paper, then, represents a review of our knowledge of the subject up to the present time, together with a complete list of authors and their publications to January 1, 1908.

TERMS AND SYNONYMS.

Various terms have been used to designate the affection under consideration—some of which depend upon the etiological conception of the disease, while others have to do only with the names of individuals. In the former class belong the terms "Megacolon Congenitum" (Mya) and "Congenital Idiopathic Dilatation of the Colon" (Hirschsprung). Is the latter Hirschsprung's disease, or Mya's disease? The term "Giant Colon" has also been used by some authors (Formad, Osler, Futcher, etc.).

By German and Dutch authors the term "Hirschsprung's Disease" is used almost exclusively, while the French, English, and American authors prefer to call it "Congenital Idiopathic Dilatation of the Colon."

We have accepted this latter title because it is the one most commonly used, and because it most nearly expresses our conception of the pathogenesis of the disease. There is abundant evidence that the disease has its origin in utero in the majority of cases. The real cause still remains unknown. The term idiopathic, therefore, is but a cloak for our ignorance, and must be rejected as soon as a more perfect knowledge of the true nature of the affection warrants it.

That the affection is essentially a dilatation, and has to do in the vast majority of cases with the colon, especially the sigmoid flexure, is proved by the clinical and pathological findings in almost every case.

CLASSIFICATION.

In this study we will follow, for convenience, the classification first suggested by Hirschsprung in one of his late papers, namely, the division of the cases into two groups:

1. Those occurring in infancy (true megacolon).
2. Those occurring in adult life (pseudomegacolon).

This classification has been accepted by a number of later authors, notably Graanboom and Löwenstein, and is probably as satisfactory as any.

A marked difference of opinion, however, is very manifest in the writings of various authors. Many believe that, since the process is a congenital one, it can manifest itself only in early life (true megacolon). Those cases which have been observed as occurring in adults they believe to be due to aggravated forms of constipation, a coprostasis pure and simple (pseudomegacolon).

Other observers, however, believe that the condition, when it develops late in life, is but the delayed manifestation of a congenital defect, which has existed all along, and has been brought out by the atony of the bowels incident to the time of life. Whichever

of these conceptions is true, it seems to be an established fact that, while the clinical picture varies little in childhood or in adult life, still a more constant association with definite mechanical obstruction has been observed in the case of adults.

In studying the reported cases, one cannot but be struck by the predominance of the congenital element in the clinical picture of the early cases, as compared with the acquired, while in the late cases the reverse is true.

Marfan and Neter are very insistent upon an anatomical basis for the disease, namely, a congenital elongation associated with loop formation in the colon. While this is not true in every case, as will be pointed out later, still it is not out of place to call attention here to the fact that the large intestine, more perhaps than any other portion of the digestive tract, is liable to be the seat of malformations (Duval). The colon as a whole has a morphogenesis hardly completed, and the various changes in form, length, and position noted from time to time are probably but variations in the progressive evolution toward a final arrangement.

The frequent anomalies are, in all probability, but reversion types. All the segments of the colon may be involved, but most often it concerns only that segment whose evolution is still unfinished, *e. g.*, the sigmoid flexure.

Johannessen has studied the position of the sigmoid in a large number of cases and finds it very variable. It may be found well above the pelvis and also in the right iliac fossa. Scokolow's investigations in this respect are of great interest. He has pointed out that the position of the sigmoid flexure is very changeable, and does not depend upon its mesentery alone, but also varies with the quantity and consistency of its contents. It is easy to see how these anatomical variations might influence materially the accumulation of feces in the colon.

ETIOLOGY.

It must be admitted at the outset that little is known as to the true cause of this affection; indeed, it is a question whether a single

cause could give rise to the various manifestations that have been noted by different observers as occurring in the course of the disease. The fact that so many theories as to its etiology have been advanced is the best evidence as to the uncertainty of our knowledge of the subject. It is highly probable that more than one etiological factor is concerned in its production, as no single course that has been thus far discovered will satisfactorily explain every case. There have been suggested from time to time in the literature at least nine different hypotheses in the endeavor to explain the causation of the affection.

1. The first of these was offered by Barth in 1870. He sought to explain it by an abnormally long mesentery which might give rise to secondary torsion of the sigmoid. This view was later advocated by Gourevitsch. Other observers, however, speak of the mesentery as either normal or shorter than normal; indeed, in but comparatively few cases is the mesentery found by actual measurement to be unusually long.

2. Hirschsprung, in 1888, suggested the idea of the congenital origin of the disease. He considered it to be a disease sui generis, due to a morbid process acting during fetal life, or more likely as an anomaly of development. He believes that both the dilatation and hypertrophy are congenital.

Some years later (1894) Mya strongly advocated this view, with the exception that he believed the hypertrophy to be secondary and not a part of the original process.

This view is substantiated by a number of observations. Billard has seen in a newborn child a large intestine, the walls of which were thickened and sclerosed. Von Ammon, in a seven months' fetus, found well-marked dilatation of the large intestine, and in a child dying shortly after birth an ectasia of the lower portion of the colon and the rectum.

Hobbs and DeRichemont report the case of a male child which at birth presented such an enormous distention of the abdomen as to interfere seriously with the delivery.

Kredel, Mya, Fütterer and Middeldorf, Escherich, and Bjorksten also report patients born with large abdomens, some of which

were later found, at operation or autopsy, to have been due to dilatation and hypertrophy of the intestinal walls.

Finally, the observation of Joubovsky throws considerable light upon the pathogenesis of idiopathic dilatation of the colon. He reports finding in a newborn child an ectasia of the large intestine associated with hypertrophy of the walls of the whole intestinal tract, together with a stenosis of the duodenum and an internal mesogastric hernia. The stenosis was due to an excessive development of the folds of mucosa, associated with an hypertrophy of the walls of the duodenum.

Analogies are to be found in other parts of the intestinal tract; *e. g.*, esophagus, stomach, rectum, etc.

From this evidence, it would appear that both dilatation and hypertrophy have actually been observed in the newborn in a few instances, and hence Hirschsprung's idea is founded upon a definite, pathological basis.

It is quite likely that while these two conditions, namely, dilatation and hypertrophy, are not inseparably bound together, still, as a matter of fact, they are both reported present in almost every instance. It is conceivable that either of these processes may be primary and the other secondary, or that they may co-exist independently of each other. Some authors (Fenwick, Genersich) believe that hypertrophy is primary and the dilatation secondary, while others (Mya, Concetti, Walker, and Griffiths) consider the hypertrophy to be secondary to the dilatation. The weight of evidence, both clinical and pathological, while it confirms the almost constant presence of both factors, at the same time tends to show that the dilatation is of relatively greater etiological importance than the hypertrophy, which is more apt to be secondary than functional.

3. Walker and Griffiths, in 1893, advanced the idea that this condition was due, in the first instance, to colitis becoming chronic. Great distention followed from the altered chemical changes in the feces, much gas being produced. Such distention of the gut would naturally render peristalsis more difficult, which would be compensated for by an increase in the size of the existing muscle fibers and the formation of new ones—a true hypertrophy.

As a matter of fact, however, the colitis is described by the great majority of observers as a late manifestation, the result rather than the cause of fecal stasis.

4. Marfan, in 1895, and later Neter, thought they found the cause of the trouble in the increased length of the colon and a multiplication and exaggeration of its loops, especially of the sigmoid flexure. They believe the dilatation and hypertrophy to be dependent upon the accumulation of gas and feces in the elongated looped portion of the colon.

This idea of the etiological bearing of variations in the length of the sigmoid in early infancy upon subsequent digestive disturbances has been shared by others. Jacobi called attention to it many years ago. Curshmann, in Nothnagel's system, states that the sigmoid in early life is relatively larger than the rest of the large intestine, and that we often find a persistence of the infantile condition which may at times become "monstrous." Hirschsprung, in his later writings, admits the possibility of the existence and influence of this anatomical factor.

While the measurements of the colon reported by some observers show an abnormal length and loop formation, many others report it as of normal length. Manifestly, then, this theory, although satisfactorily explaining some cases, does not apply to all.

This conception is, perhaps, more applicable to the disease in later years; for instance, when it is observed in the insane or in the aged, where it is clearly associated with marked inactivity of the bowels and coprostasis, with consequent dilatation and hypertrophy of a portion of the large intestine (Löwenstein).

5. Treves, in 1898, after reviewing many of the cases that had been reported up to that time, rejected the idea that the dilatation was idiopathic. He sought to explain it and the accompanying hypertrophy, as due to actual mechanical obstruction. He quoted a number of cases in support of this view, and additional ones have since been added. As stated by him, the phenomena observed in this connection suggest in a most emphatic way that there is an obstruction to be overcome, and that the hypertrophy is quite inconsistent with the conception of an "idiopathic" dilatation of the bowel.

Unfortunately, however, for this theory, as for the others, there are many cases that have come to operation or to autopsy in which careful search has failed to reveal any such obstruction.

6. Concetti, in 1899, described in a carefully studied case, a congenital aplasia of the muscular tunics of the large intestine, immediately above the rectum. He believed this to be the primary, fundamental lesion. Growing out of this as a result of the processes of fermentation and putrefaction, and the formation of gases resulting therefrom, there develops a well-marked ectasia of the intestine. Here, in turn, feces in large quantities accumulate. Finally, the efforts of the intestine to overcome this stagnation result in the development of a well-marked hypertrophy in the segment immediately above. This hypertrophy, he believes to be due in part to connective tissue proliferation, the result of continued irritation of the vessels by the toxic substances produced by the processes of intestinal putrefaction.

In studying the reported cases, one recognizes the pathological picture drawn by Concetti with considerable frequency, but not always, by any means. The connective tissue proliferation described by him is noted only in a small percentage of cases. It was not present in our own case.

7. Fenwick, in 1900, reported a case in which he was able to demonstrate a definite spastic contraction of the sphincter ani, associated with fissures in the anal margin. This idea of the spastic contraction of a portion of the colon has been suggested by others, notably Gee and Hichens. Since this condition is one that can be very readily recognized clinically, and since it has been reported as present in so few of the cases that have been carefully studied, it is manifestly impossible that it should play a very important role in the etiology of the disease.

8. In 1907 Hawkins proposed the name of "neuropathic dilatation and hypertrophy of the colon," basing it upon his conception of the etiology of the disease, namely, that it was a neuromuscular defect in one segment, through which the colon was unable to propel its contents. In this way a functional hypertrophy of the segment immediately preceding the paralyzed

and dilated one is produced. Formad (1892) had suggested the neuropathic theory of the causation of this disease, but it was not generally accepted.

Lennander (1900) urges this as the most probable explanation of the condition.

Pennato (1902) considers the causative factor to be primary paralysis of a segment of the intestine.

Bing (1907) believes it to be due to changes in the nervous system especially of the sympathetics of the intestine.

Richardson and Fitz, in this connection, call attention to the close relationship existing between this condition and phantom tumor, as showing a possible nervous origin.

On the other hand, the histological findings in the cases that have been studied microscopically show little or no change in the structure of the nervous plexuses of the intestine. The powerful peristalsis which has been observed so frequently, and to which attention has been called, renders less plausible the theory of weakness through disturbed innervation. In addition to this, the hypertrophy of the intestinal musculature, so commonly present, disproves it as a constant factor.

9. Perthes, in 1905, in an elaborate report of a carefully studied case, contends that valve formation in the intestine was responsible in his case for the condition found. He was able to demonstrate a definite valve action just below the distended portion. He did this in a rather ingenious way, *i. e.*, by injecting water through a previously established artificial anus. When injected in this way, the water would distend the bowel, but failed to pass through the valve. When injected into the rectum, it would pass through the valve and out through the artificial anus. He also demonstrated at operation the existence of the valve. This idea of the valve formation as the chief etiological factor in the disease has been shared by others both before and after Perthes.

To Roser, perhaps, belongs the priority in suggesting it. He has described several different ways in which a valve may be formed in the intestine, but the important fact brought out is, that under certain conditions it is actually accomplished. Since

the appearance of Perthes' monograph, many of the German authors, especially, have accepted his view of the pathogenesis.

As opposed to this idea, is the inability to demonstrate the valve formation after the intestine has been removed from the body. Perthes answers this objection by calling attention to the fact that it is not an organic, but a functional obstruction, due entirely to the position of the affected portion. He himself does not claim that it explains every case. Nothing that suggested a valve could be demonstrated in our case.

Among other hypotheses that have, from time to time, been suggested as explaining certain individual cases, may be mentioned that of Richardson, in which he thought pressure of a retroflexed uterus was largely instrumental in the production of the condition; diastasis of the recti muscles (Levi); adhesions to surrounding structures (Murray); atonic conditions of the intestinal walls, the result of wasting diseases (Griffith), etc.

In our own case the picture presented by the disease corresponded in every respect to, and suggested very strongly, that presented by a lymphangiectasis as it is seen in other parts of the body, *i. e.*, macroglossia, macrocheilia, etc. Here the most striking feature, next to the immense size of the colon, was the thickness of the mesocolon, which was composed chiefly of enlarged lymph glands and enormously dilated lymph and bloodvessels. The dilatation of the lymphatic and vascular systems in the mesocolon corresponded exactly with the dilated segment of the bowel. The whole appearance of the dilated and hypertrophied bowel suggested hypernutrition, a species of giantism, as it were, due to the increased amount of blood and lymph supplied to the affected portion. A section of the mesocolon, together with one of the enlarged lymph glands removed at the time of the first operation, showed nothing but a marked hyperplasia. That this hypothesis could explain all the cases seems very probable, but that it may be the cause of a considerable number, however, seems equally probable, since in a large proportion of the reported cases where the condition of the mesocolon is stated, this same thickening and hypertrophy of the lymphatic and vascular elements has been observed.

The clinical picture of the disease is usually a very pronounced one. The cardinal symptoms are obstinate constipation and an enlarged abdomen, in a patient otherwise in fairly good health. The disease, as a rule, manifests itself very early in life, frequently the first passage of meconium is delayed several days. The constipation thus early begun may continue throughout life. In other cases the constipation may be noticed only after a few weeks, months, or even years. Under these circumstances a movement of the bowels is always brought about with difficulty, and rarely without the aid of enemata or cathartics, except during the periods of diarrhea, which will be referred to later. This extreme difficulty in producing an evacuation is one of the characteristics of the disease. Enormous quantities and great varieties of cathartics, together with frequent large enemata, have been used with little or no effect. Unusual postures, assumed by the patient during the act of defecation or passing of gas, are reported by a number of authors, such as leaning over the back of a chair, standing on the head, knee-chest position, etc.

The distention of the abdomen may be observed at birth, soon after, or at a later period, and is due to distention of the dilated portion of the colon with gas and feces. The dimensions of the dilated abdomen are, at times, enormous, the circumference may be greater than the height of the patient. On inspection, one is struck at once by the disparity between the size of the abdomen and the rest of the body, which is emaciated. The appearance of the abdomen is rather barrel-shaped; the greatest circumference lies usually somewhat above the umbilicus; the distance between the umbilicus and ensiform cartilage, and the umbilicus and the symphysis, being very much increased over the normal.

Just as abnormal as the dilatation of the abdomen is the length of time during which, in many patients, there is no stool. Frequently one gets a history of the patient going a week without a movement; periods of five weeks (Johanessen), six weeks (Roth), nine weeks (Rolleston and Hayward), and three months (Gay) have been noted. After shorter or longer periods, constipation frequently alternates with diarrhea, which usually relieves some-

what the abdominal distention, but this relief is only temporary, the abdomen never entirely regaining its normal dimensions.

The facies presents a rather dull, apathetic appearance. The skin is rather dry, harsh, and leathery, except over the distended abdomen, where it may be tense or shiny. The complexion is frequently sallow or pasty. The veins over the abdomen appear distended and prominent. The abdominal walls are thinned, and through them vigorous peristaltic waves, or coils of distended intestine, may often be observed. A diastasis of the recti muscles may occasionally be present. One of the most striking features is the change that takes place in the costal angle and plane of the chest wall. The former is rendered very wide and obtuse; the latter, instead of its normal approximately vertical position, as a result of the continuous pushing up of the diaphragm by the distended intestine, becomes at times almost horizontal.

The abdominal distention may or may not be uniform. In some cases the distended intestinal coils can be seen or felt more prominently upon one side than the other, more especially on the left side. This was pronounced in our own case. On palpation, one may at times feel masses of hardened fecal matter filling the distended bowel. At other times the abdomen is everywhere soft, and is, as a rule, singularly free from tenderness. During the active peristalsis the enlarged and distended loops of sigmoid can frequently be grasped in the fingers. On percussion, the abdomen may be everywhere tympanitic, owing to the great accumulation of gases in the intestine. The area of liver dulness is very much reduced, and its lower border elevated considerably above the normal. At other times dull areas may be elicited corresponding to the fecal impaction. Movable dulness has never been observed. Audible borborygmi have been frequently reported, sometimes so loud as to be heard in the adjoining room.

The fecal discharges from the intestine are perhaps characteristic. Sometimes they are very dry and inspissated, at other times putty-like in consistency and of rather characteristic yellowish, brownish, or greenish color, and having a peculiarly offensive odor. At other times the discharges, both solid and gaseous, have been

noted as odorless. Vomiting is not a constant symptom, and, when it occurs, it takes place late in the course of the disease, and is usually referable to some intercurrent complication. Pain is also not a marked nor constant symptom, being more pronounced when diarrhea is present or during active peristalsis.

Edema of the lower extremities and scrotum has been observed in a number of cases.

On rectal examination, the sphincter is usually normal, although Fenwick and others have described a spasm which they believe to be of etiological importance. The majority of observers, however, have failed to note anything suggesting this condition. The rectum itself is usually found to be empty and relatively normal. A ballooning of its walls has been noted, and is present in a considerable percentage of cases. This is of some significance as indicating an obstruction farther up. Anal fissures are rarely present. A rectal tube can usually be passed unobstructed for a considerable distance, frequently evacuating large quantities of gas or liquid feces.

Marked disturbances have been observed from time to time in the other structures of the body. The lungs will be found encroached upon by the changed position of the liver and the upward pressure of the diaphragm. The lower lobes of the lungs may be more or less atelectatic. Breathing will be largely costal. Dyspnea, which may not be noticed at the beginning, may later become pronounced, interfering very seriously with the comfort and, perhaps, life of the patient. Bronchitis or bronchopneumonia are not infrequently observed later in the course of the disease, due, in all probability, to disturbed conditions in the chest, possibly to metastasis from the intestinal obstruction. The heart's action may also become very much interfered with, producing a weak and irregular pulse, dyspnea, etc. The kidney function appears to be seldom disturbed—which seems surprising, owing to the increased intra-abdominal pressure and the weight of the mass of contained feces. Gee reports a case of double hydronephrosis associated with this condition, and Fenwick one of compression of both ureters with grave hematuria. Roth has observed, in two

cases, a peculiar deformity of the bladder, consisting of a cone-shaped dilatation extending to the umbilicus. Germer and others have also observed this, and it was present in one of the Johns Hopkins Hospital list. Great increase in the amount of indican has been observed; albumin and casts are not usually found.[1]

The nervous system does not seem to be directly affected by the disease. Children, in the later stages, often become apathetic and somnolent. Convulsions have been observed in a few instances. Fitz and Richardson call attention to the close relation-

[1] There have been eleven cases observed in the Johns Hopkins Hospital up to January 1, 1908, 9 males and 2 females, 7 whites and 4 blacks. The ages have ranged from seven months to fifty-five years, though nearly all were in children, to wit, one at seven months, one at one year, one at nineteen months, one at three years, two at four years, one at six years, one at nine years, one at ten years, one at thirteen years, and one at fifty-five years, the last being the first case admitted to the hospital. Six cases were admitted on the medical side, two being later on transferred to the surgical side. Five cases were admitted on the surgical side, one being treated three years later on the medical side. In three cases colostomy was done, death following in one case from peritonitis. With the exception of this death, all the other cases were discharged improved, except one which was not treated.

	Sex.	Race.	Age.	Year of admission.	Service.	Discharged.	Treatment.
Rosa Callahan	F.	W.	55 yrs.	1891	Medical.	Improved.	Medical.
Ralph Aldeman	M.	W.	7 mos.	1892	Medical.	Improved.	Medical.
John White . .	M.	C.	10 yrs.	1892–1895	Med. and Surg.	Improved.	Colostomy.
J. A. Page . .	M.	C.	9 yrs.	1892–1895	Medical.	Well.	
J. D. Agel. . .	M.	W.	4 yrs.	1894	Surgical.	Improved.	
Claudius Klein	M.	W.	6 yrs.	1897	Surgical.	Improved.	
Chas. Cole . .	M.	C.	12 yrs.	1898–1900	Med. and Surg.	Died peritonitis.	Colostomy.
Chas. McCarthy	M.	W.	4 yrs.	1900	Medical.	Improved.	
Geo. Muhlberg	M.	W.	3 yrs.	1900–1904	Surg. and Med.	Improved; also had tb. peri.	
Andrew Edwards	M.	C.	13 yrs.	1906	Surgical.	Improved.	Colostomy.
Evelyn Griffith	F.	W.	19 mos.	1907	Med. and Surg.	Not treated.	

ship existing between this condition and phantom tumor. Perthes describes a severe pain in the shoulders which he observed in both of his patients. Symptoms suggesting meningitis have been reported by Berti, Bernheim, and others. An interesting case of gastric tetany has recently been reported by Langmead.

Van der Kolk, more than fifty years ago, called attention to the frequent occurrence of dilatation of the colon in cases of chronic insanity, and regarded it as one of its pathological conditions (Hurd). In this connection it is interesting to note that, since this paper was begun, I was called to one of the State Hospitals for the Insane to see one of the inmates, whom I found to be suffering from a form of intestinal obstruction very closely resembling pseudomegacolon. Indeed, I believe it may properly be classed as such.[1]

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

The diagnosis is based upon two chief symptoms, namely, chronic obstipation and meteorism. When these two symptoms, as they frequently do, become very pronounced, the diagnosis in both children and adults is rendered easy, as there are very few conditions with which the clinical picture is likely to be confused. So striking is it in pronounced cases, that one cannot

[1] A. H. W. Inmate of one of the State Insane Asylums, aged forty-eight years. Single. Male. Mildly demented. Three years ago the abdomen began to distend rapidly; complained of some pain. Tube passed at this time without any difficulty. It was not possible to obtain any movement from the bowels either by purgatives or enemata. Three days later, bowels were moved by means of castor oil, and the condition returned to normal. Since that time he has had three similar attacks, which lasted for two or three days, the last one in January, 1908. At this time the same condition was noticed, except that it was more aggravated than in the previous attacks. Upon examination, there is an enormous distention of the abdomen, the middle portion projecting forward while the flanks were relatively flat; skin is tense and stretched, the abdominal veins much distended, and the intestinal patterns well marked, being more pronounced on the left than on the right side. There is visible violent peristalsis, and loud borborygmi can be heard. The intestinal coils can easily be grasped in the hand. The abdomen is everywhere tympanitic and no mass is to be felt. Rectal examination is negative. Leukocytes, 7400.

well fail of a correct diagnosis. In children, particularly those who are of a rachitic tendency or the victims of malnutrition, the wan, pinched expression, sunken cheeks, sallow complexion, emaciated extremities, in marked contrast to the at times enormous balloon-like distention of the abdomen, form a picture that is easily recognized. (See Fig. 4, Escherich's case.) In adults the same symptoms are often present, only to a less degree. The conditions which have been most often mistaken for the trouble are tubercular peritonitis and some forms of chronic ileus, such

FIG. 1.—Shows one of the Johns Hopkins Hospital series.

as volvulus, anular carcinoma of the intestine, dysenteric ulceration, ovarian cysts, etc. Heredity does not play a very important part in the diagnosis, as in only a few instances has it been observed. Duhamel and Bing report cases, and in the Johns Hopkins Hospital series father and daughter were affected.

The disease is more common in boys than in girls. Of 112 patients analyzed by Löwenstein, 87 occurred in the male, and 25 in the female—a proportion of $3\frac{1}{2}$ to 1. In adults, the ratio

between the sexes is different, being in the proportion of 2 to 1 in favor of the male. The disease runs a very chronic course, stretching over periods of years, or even a comparatively long lifetime. On the other hand, in a few instances reported by Pfisterer, Hirschsprung, and others, the patients succumbed after a period of six and ten weeks respectively.

FIG. 2.—Shows one of the Johns Hopkins Hospital series.

The course of the disease is irregular. Periods of improvement may be noticed from time to time, but exacerbations often follow, and, even when the prescribed treatment is scrupulously carried out, the results are not always satisfactory. The disease usually makes its appearance soon after birth. Of those cases where the time of onset has been recorded, 70 per cent. occurred immediately

after birth, and about 20 per cent. within a few days or weeks. In a much smaller percentage it appears after a period of years. On account of the severity of the symptoms, recourse is had early to cathartics and enemata, the absolute necessity for which is one of the important diagnostic points. The alteration of obstipation with spontaneous diarrhea; the character of the discharges, the frequent lack of relief from the abdominal distention, in spite of profuse and frequent evacuations, particularly in the case of

FIG. 3.—Shows one of the Johns Hopkins Hospital series.

small children; the gradual or rapid decline, associated later with symptoms of intestinal perforation, or with some intercurrent affection, possibly pulmonary in character, all point strongly toward this condition. The fact that children who have suffered from constipation from birth frequently do not consult a doctor until some years later gives rise to the supposition that possibly many of the milder grades of this disease never come to the physician's notice, and hence are not recognized.

Taking all these facts into consideration, if in addition an

examination of the abdomen shows no tumor formation other than that accounted for by fecal accumulation, and examination of the rectum reveals no obstruction low down in the bowel, the strong presumption is that we are dealing with Hirschsprung's disease.

As special aids to diagnosis in doubtful cases, enemata of bismuth and oil given in the knee-chest position, and an *x*-ray subsequently taken in the abdominal position, will give a fairly

FIG. 4.—Escherich's case

characteristic shadow. If the bismuth does not show in the descending or transverse colon, the distended loop must be the sigmoid. An *x*-ray taken after the insertion into the rectum of a metal tube may also aid in determining the location of the affected segment. Diaphanoscopy may also be, at times, of service. In differentiating between tubercular peritonitis and this disease, it is well to bear in mind that ascites has never been observed in connection with Hirschsprung's disease.

PROGNOSIS.

The prognosis in Hirschsprung's disease is always uncertain. While the disease itself is rarely rapidly fatal, still the patient always leads a precarious existence, owing to malnutrition and digestive disturbances incident to the trouble. Intercurrent affections are very commonly observed, and not infrequently the cause of death is due to one of these. Peritonitis, the result of perforation, heart failure, and diseases of the respiratory organs, particularly bronchitis and bronchopneumonia, are the most common of the intercurrent affections.

The prognosis is influenced by the age of the patient; the younger the individual, the more unfavorable the prognosis.

TREATMENT.

The treatment of this disease may be divided into medical and surgical. Medical treatment consists of the therapeutic agents usually employed in chronic constipation, namely, cathartics, enemata, the use of the rectal tube, massage, electricity, tonics, exercise, regulation of the diet, etc. Schreiber lauds the opium treatment, and reports a cured case, with co-existent enterospasm.

The surgical treatment has varied much in the hands of different surgeons, and may be classified as follows:

Intestinal puncture, either through the abdominal wall or after laparotomy. A considerable number of cases are to be found in the literature which have been treated in this very unsurgical manner. The relief is usually only temporary, and the ultimate result unsatisfactory.

Exploratory laparotomy alone, as a diagnostic aid, has been employed in at least twenty cases. In some instances, the abdomen was closed immediately; in others the contents of the dilated intestine have been milked out through the anus.

Colotomy, with evacuation of the contents of the bowel and

immediate closure, has been done eight times with fairly satisfactory results.

Colostomy has been performed according to Ito and Soyesima twenty-three times. As a preliminary to a more radical operation, this is a very valuable aid. It also gives opportunity to make a positive diagnosis. A few cases have recovered with a permanent fistula. Colonplication has been used by Kredel, Franke, and others, and the results reported do not justify its continued use.

Colopexy has been tried a number of times. Treves and Richardson report failures, but the majority of cases observed long enough have been fairly satisfactory.

Entero-anastomosis without resection has given good results in most cases. Pfisterer and others, however, have reported failures. In our own case, the entero-anastomosis, even with a persisting fecal fistula, failed to prevent the continued accumulation of feces in the distended loop.

Lingeman and Franke report cases of what they call "shunting off of the distended loop," an operation similar to entero-anastomosis. Both cases, however, died of peritonitis.

Perthes made use of a procedure similar to the operation of pyloroplasty for pyloric obstruction. The result in his case was unsatisfactory. Morris tried splitting of the soft parts posteriorly after the modified Kraske operation on the sacrum, and evacuated the intestinal contents after introducing the arm into the bowel.

Treves amputated almost the entire large intestine, including the rectum, bringing the splenic flexure out of the anus. Resection of the affected portion with subsequent entero-anastomosis has been performed twenty-one times, with good results in fourteen cases. This is unquestionably the operation of choice, other things being equal.

The technique employed in our case proved most satisfactory. It differs materially from the method usually employed, in that the preliminary colostomy is made in healthy bowel above the dilated segment. After this segment has been relieved of its impacted contents and recovered somewhat its normal size, the second operation, consisting of a lateral entero-anastomosis between the

segments immediately above and below the distended portion, is performed. After a sufficient time has elapsed for the patient to recover entirely from the preceding operations, the third step in the procedure is taken. This consists in resection of the whole of the affected portion of the colon, with closure of the free ends of the intestine. The advantages of this method over any other are, first, that the colostomy is made in healthy bowel at a point where it can remain undisturbed as long as desired; second, it is left as a safety valve until all the stages of the operation have been accomplished, when it is finally closed under cocaine.

In an interesting table comparing the results of medical and surgical treatment, Löwenstein gives the following figures: Of 59 cases treated medically, 39 died, a mortality of 66 per cent.; 9 were improved, 4 unimproved, and 7 entirely well, a recovery rate of 12 per cent.; while of 44 cases treated surgically, 21 died, a mortality rate of 48 per cent. Two remained unimproved, 7 were improved, while 15 were completely cured, a recovery rate of 34 per cent. From this table it would appear that surgical treatment has a mortality rate two-thirds that obtained by medical measures, and a recovery rate almost three times as great.

PATHOLOGY.

The principal seat of the pathological process is in the large intestine, and in more than one-third of all the cases the sigmoid flexure is alone involved. In practically all the cases it is included in the affected portion. The whole of the large intestine was found involved in about 15 per cent. of the cases. The rectum and the small intestine are rarely affected. In addition to the small intestine, the stomach (Gourevitch), the appendix (Muhlberger and Tschernow), and the esophagus (Bergman) have been reported as taking part in the dilatation. The transition from the normal dilated portion is usually gradual, but may be abrupt, whereas the transition from the dilated portion to the normal is usually the reverse. There may or may not be evidence of me-

chanical obstruction of one form or another. These demonstrable forms of mechanical obstruction are more frequently met with in the adult than in the child, and may give rise to symptoms erroneously classified as Hirschsprung's disease. A pathological study of many of the cases reported as Hirschsprung's disease would undoubtedly show them to be cases of pseudomegacolon. As pointed out by Perthes, the characteristic of congenital idiopathic dilatation of the colon (true megacolon) is the inability to demonstrate at operation, or autopsy, a definite mechanical obstruction. Upon opening the abdomen of a patient the subject of this disease, one is at once struck by the enormous dilatation of the colon in whole or in part. The dimensions of the dilated portion are at

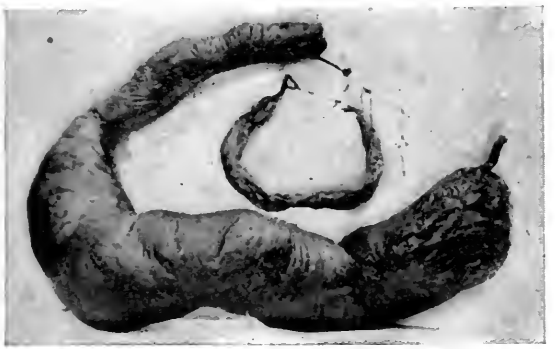


FIG. 5.—Specimen from Formad's case, with normal colon for comparison.

times prodigious, reaching a diameter of six to eight inches (Treves, Hawkins, Formad, etc.). Its capacity is, at times, even more striking. Peacock's case contained sixteen liters, Formad's case forty pounds, etc. The dilated portion occupies a rather characteristic position in the abdomen, filling almost the entire cavity, pushing aside and compressing the small intestines and the remaining organs, frequently obscuring them entirely from view. The large intestine, instead of following its usual arrangement, disposes itself in two parallel limbs, running more or less perpendicularly.

The walls of the intestine show marked changes, the result of the

dilatation and hypertrophy. The serous coat is usually roughened, the teniæ less pronounced, or obliterated. The whole colon may, at times, appear elongated, with increased loop formation, as described by Marfan and Neter.

In advanced cases peritonitis may be present, due to necrosis of the intestinal wall and resulting perforation. External evidences of this necrosis may be found in the bowel wall, which is palpably thickened in most cases. The mesocolon is the seat of well-marked changes, consisting in variations in length, sometimes

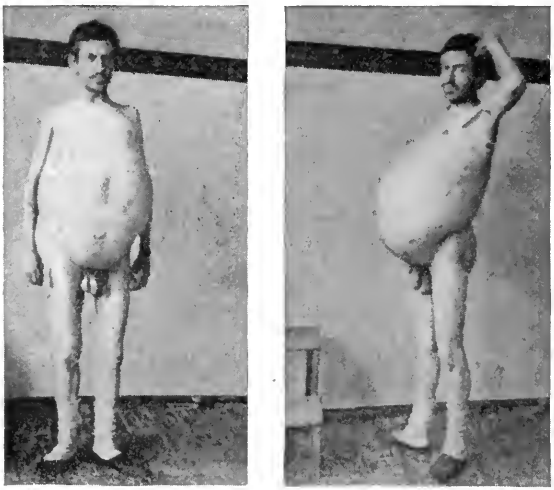


FIG. 6.—Formad's case.

longer and sometimes shorter. At times it is of great thickness, due to the immense increase in the lymphatic and vascular elements, as manifested in the enormous dilatation of the lymph and blood-vessels and the increased size of the lymph glands, a condition resembling very closely lymphangiectasis. Upon opening the intestine, feces in large quantities may be evacuated. As has been already pointed out, the intestinal contents are rather characteristic in color, consistency, and odor. The mucosa is frequently markedly pigmented, sharing to a certain extent in the hypertrophy of the rest of the intestinal wall. Patches of ulceration can be frequently

seen, occupying larger or smaller areas and varying in depth from slight erosions to complete perforation.

Microscopic examination of the wall of the tremendous colon of Hirschsprung's disease shows an interesting picture. In general, we have to deal with a quite uniform hypertrophy of all of the intestinal tunics, especially marked, however, in the muscularis. Grafted, as it were, on this hypertrophy are many degenerative changes.

I have been able to compare the changes seen in the case here reported with those found in one kindly given me for study by Professor W. G. MacCallum. Dr. MacCallum's specimen is from an undoubted congenital case of Hirschsprung's disease, the clinical history of which is in the surgical department of the Johns Hopkins Hospital. It will be referred to as Pathological No. 1497.

The description of our present case may be best given by a brief account of the different tunics of the bowel wall.

The mucosa in this case is everywhere almost twice its normal depth, being much thickened by a diffuse round-cell infiltration. In addition, there is a marked increase of the stationary or usual connective tissue cells forming the stroma of the mucosa. The mucosal vessels (especially the veins) are undoubtedly enlarged, but by no means disproportionately so when one considers the growth of the entire mucosa here and the great size of the normal mucosal veins in the human colon. The mucosa is loaded with yellowish brown amorphous pigment masses, which account for the very noticeably pigmented appearance which it presents even to the naked eye. On opening the colon in most of these cases, the deep mucosal pigmentation has been remarked on by the observer. It is generally a deep velvety brown, but may, as was the case in the specimen No. 1497, be almost black. The pigment, sometimes free, is oftenest enclosed in the connective tissue cells, and does not appear to differ, except in amount, from that always present. (See Figs. 7 and 8.) It is not improbably associated with the stasis of feces for prolonged intervals. These changes are in some places associated with the presence of fewer of the crypts

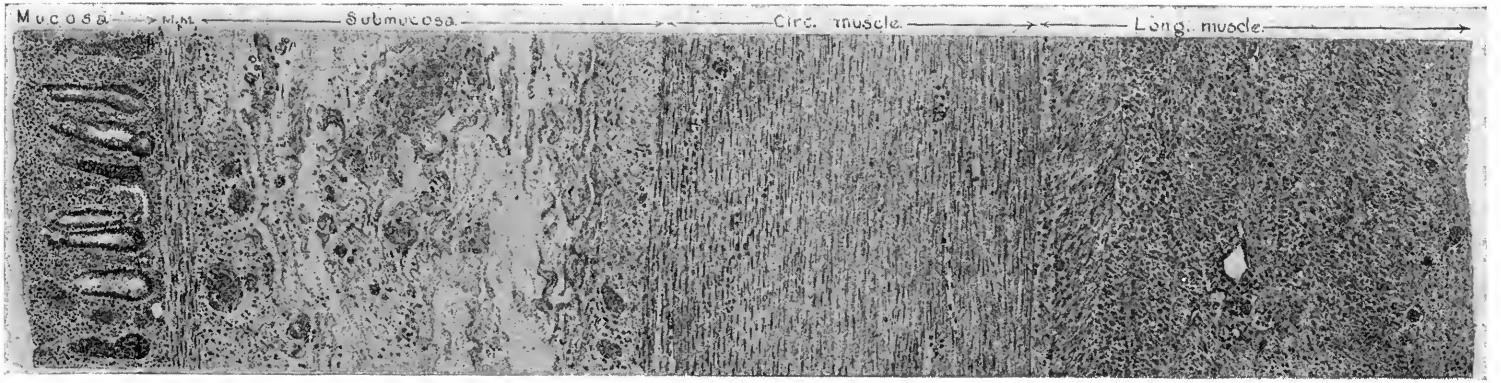


FIG. 7.—Cross-section giant colon wall. × 70.

of Lieberkühn, but in other areas certainly these are not reduced in number. The surface epithelium is frequently missing, but where present is clearly seen to be more cubical than cylindrical in type. It is not difficult to find goblet cells in the crypts, but they are certainly far less numerous than in the normal colon, where anyone familiar with this region will remember most of the cells are always distended with mucus.

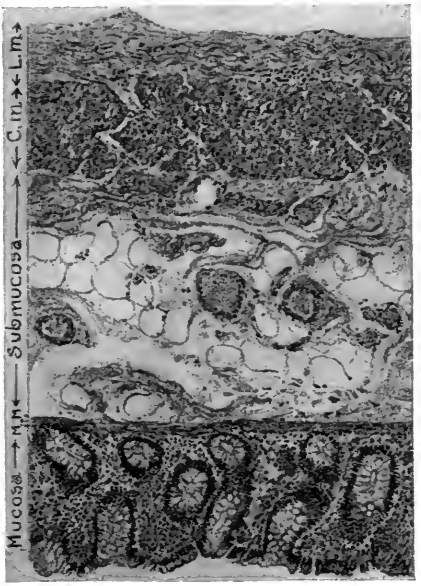


FIG. 8.—Long section of normal colon. (From an executed criminal.) × 70.

In general, then, it is possible to recognize, in the changes which the mucosal layer presents, a chronic inflammation, for we have here round-cell infiltration, growth of the fixed connective tissue cells of the region, together with the bloodvessels and evidences of degeneration of the superficial epithelium. The stimulus, no doubt, has been the proximity of large, retained fecal masses—a factor frequently potent enough, as the literature shows, to cause deep ulcers, necrosis of the entire intestinal wall, with consequent peritonitis. In the present cases, no evidence of mucosal ulcers of any extent was found.

The muscularis mucosæ is very considerably hypertrophied, though by no means as greatly as in other reported cases. Its

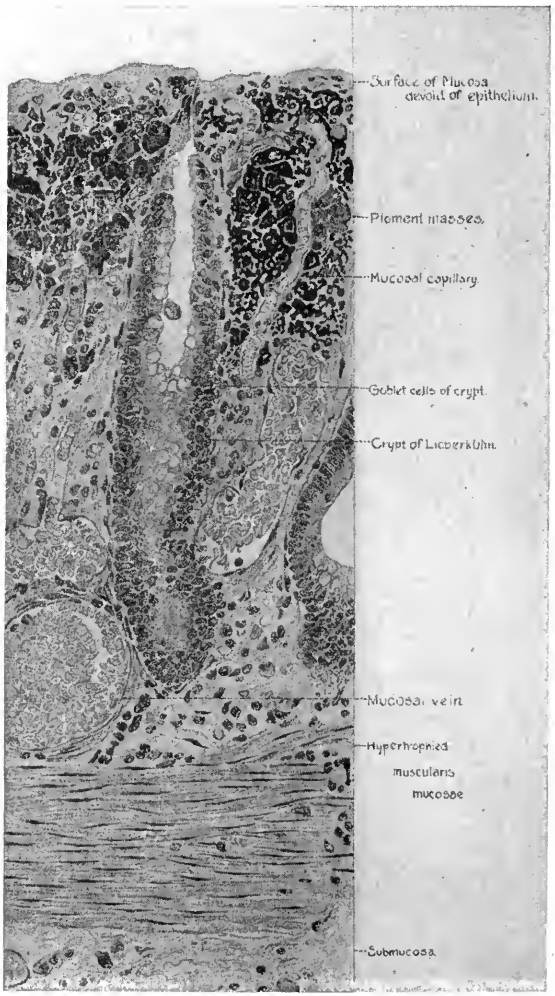


FIG. 9.—Mucosa giant colon. × 370.

growth has occurred chiefly, or almost entirely, in the circular fibers. They appear healthy in all respects, and show none of the fibrous tissue invasion or leukocytic infiltration seen by other

observers. It is interesting to note here that we may be justified in also associating the growth of the mucosal muscular coat with the presence of hard, intestinal contents, such as dense fecal scybala, inasmuch as the studies of Disse and others in comparative histology show an apparently delicate response in the thickness of the muscularis mucosæ in accordance with the hardness of the food and dejecta—changes which were seen by Walker and Griffiths, and by Fütterer and Middeldorf.

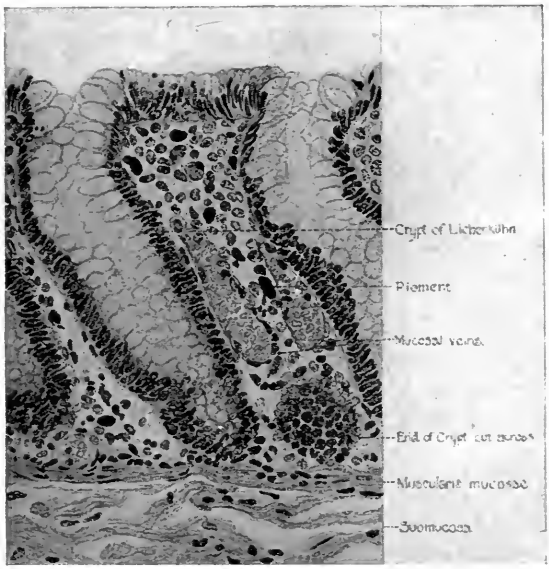


FIG. 10.—Mucosa normal colon. × 300.

It is difficult to see why a well-marked case of Hirschsprung's disease would not necessarily give rise to some of the changes in the mucosa just described, and one wonders whether closer scrutiny would not reveal them in those cases where the mucosa has been reported normal, *e. g.*, Bing's cases.

The submucosa, in some places thin, in others thick, shows large fasicles of connective tissue. The vessels of Heller's plexus are especially large, and show in many sections obliterative endarteritic changes. The ganglion cells of Meissner's plexus were normally

abundant, and exhibited no sign of degeneration, being seen beautifully after the usual stains, and apparently healthy.

Of the muscle coats, the circular one is relatively huge, occupying in some places 42 per cent. of the entire thickness of the intestinal wall, whereas it normally is seldom in excess of some 20 per cent. This is in accord with the findings in many of these cases.

Ganglion cells belonging to the nodes of the plexus of Auerbach were seen in several fortunate sections, and showed no departure from the normal. In fact, if anything, the nerve cells of both plexuses were in slightly larger clumps than normal, and in all cases in a perfect state of preservation.

It is of interest to note that in some sections of the other case studied (Path. No. 1497) remarkable degenerative areas were found in the submucosa. In such spots there is a complete hyaline transformation of this tunic, no evidence of structure remaining, save a few vascular channels. It is in such areas as these, causing an obvious weakening of the bowel wall, that some have preferred to see the etiology of the disease (Walker and Griffiths). They are almost certainly secondary changes in the life history of the enlarged gut.

The gigantic circularis seems always a prominent feature, but in some cases it is prevented from forming a great relative proportion of the gut wall by the great width of other coats, notably the submucosa (Mya and Concetti). In specimen No. 1497 the circular coat attained a greater thickness than the entire normal wall (1.7 mm.), and constituted almost 50 per cent. of the whole thickness of the bowel.

The longitudinal muscle coat was uniformly distributed, showing little evidence of any localization of the fibers into definite teniæ. It is some four times the normal thickness.

Well-differentiated Van Giesen stains do not demonstrate any considerable connective tissue invasion of the muscular coats, as has been reported by Mya, Concetti, and others. The muscle cells are everywhere, in most respects, normal in appearance and apparently functioning. They do not impress one as the various sized fibers of a myomatous growth.

The serosa was considerably thickened, and showed the presence of greatly enlarged lymphatics and bloodvessels. A table is given below comparing the measurements of the different bowel tunics in the two cases here studied, in a normal well-distended colon, and in the cases reported by Mya and Concetti, respectively.

Cases.	Mucosa.	Muscularis mucosæ.	Submucosa.	Circularis.	Longitudinalis.	Serosa.	Total.
	MM.	MM.	MM.	MM.	MM.		
Mya's case . . .	0.055	0.220	0.550	0.330	0.035	1.605	2.695
Concetti's case . .	0.513	0.105	1.398	0.447	0.447	0.057	2.520
Pres. case . . .	0.520	0.050	0.220	0.750	0.200	0.020	1.770
Two different areas	0.500	0.075	0.900	0.450	0.200	0.037	2.160
Path. No. 1497 . .	0.350	0.125	1.025	1.670	0.375	0.010	3.550
Normal colon . .	0.290	0.017	0.320	0.170	0.050	0.005	0.850

The greatest interest in the pathological anatomy lies in what suggestions it might give as to the causative factors involved. One must say frankly that here, as often elsewhere, no real light has been shed on the question of pathogenesis. This statement is certainly true, in spite of the various interpretations of the histological picture which have been made from time to time.

That picture may be considered as relatively constant now, for on it all careful reports agree. It will support most of the various theories which have been advanced to explain Hirschsprung's disease; it will prove none of them.

Some of the adherents of the anomaly of development theory explain the changes as consequent on some defect in the nervous elements of the gut wall, leading to impairment of the peristaltic wave—perhaps, as some one has remarked, to a non-coördinated peristalsis. Indeed, there has been repeated suggestion of congenital absence of the normal nervous plexuses in the colon wall.

No adequate studies of either the physiological or anatomical condition of the nerve elements in these colons have ever been made. It is practically impossible to find any previous record of

the condition of the nerve cells or of their presence or absence, so that the suggestion of nervous defects does not seem to have rested on any definite observations. Search in the two cases here reported has shown intact and apparently healthy ganglion cells in both Meissner's and Auerbach's plexuses (see Fig. 11).

In degenerative areas, it is true, the nerve mechanism has suffered, but, as has been emphasized, such changes are clearly secondary incidents in the life history of the enlarged bowel, and to be correlated with other senile processes, such as the overgrowth of the vascular coats, etc.

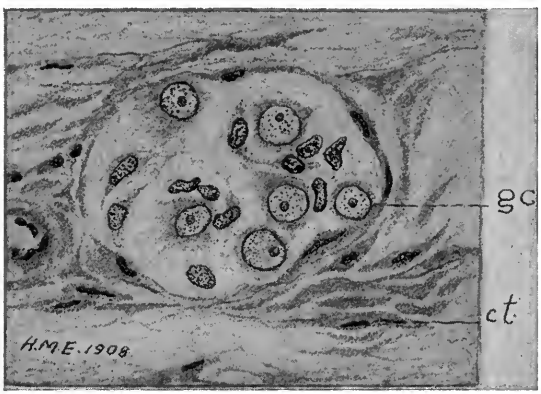


FIG. 11.—Ganglion cells at one of the nodal points of Meissner's plexus in the wall of giant colon. (Case here reported.) *g*, *c*, sympathetic ganglion cells; *c*, *t*, connective tissue cells. Drawn under camera lucida. × 600.

The immense size of the blood and lymph vascular systems might well suggest this as a factor in etiology, and that the giant bowel has resulted from "overnourishment," as it were, caused also as a developmental anomaly. It is not unlikely, however, that the vessels have simply grown pari passu with the enlarging colon; at present no proof can be adduced of their role in pathogenesis.

It is only natural that any one who has seen the effects of experimental obstructions in the intestinal tract of animals, would turn to these mechanical causes as a simpler, and, perhaps, quite as plausible, cause of the disease. For, though there can be no

longer any doubt that an obstruction does not exist at the time many cases are seen, we do not know, as Marchand[1] remarks, whether hindrance to evacuation or peristalsis originally present could not have led to dilatation, which now, making effective peristalsis more difficult, caused hypertrophy and the other changes, inaugurating a vicious circle. It is important, in this connection, to note that, in several experimental hypertrophies which have recently been recorded, the histological structure of the bowel strikingly resembles that seen often in Hirschsprung's disease. Light may come, then, from experimental pathology. I wish to acknowledge my indebtedness to Mr. H. M. Evans, of the Johns Hopkins Medical School, for the accompanying drawings and for valuable assistance in the preparation of this paper.

Bibliography.

Ahlberg. Allm. Seven. Lakartid., Stockholm, 1906, iii, p. 209.

v. Ammon. Die angeborenen chir. Krankheiten d. Menschen. Atlas Tafel ix, Berlin, 1842.

Baginsky. Berl. klin. Wochenschr., 1904, No. 48, p. 1252.

Banks. Dublin Quart. Jour. Med. Sci., 1846, vol. i, p. 235.

Baron. Jahrb. f. Kinderheilk., 1907, vol. lxvi, p. 741.

Barth. Wagner's Archiv d. Heilk., 1870, vol. xi, p. 119.

Bastianelli. Oral communication to Concetti.

Baumgartner. Presse Méd., October, 1907.

Beighing. La Clinica Medica Italiana, vol. xl, Part 1.

Berghinz. Ibid., 1901, p. 26.

Bernheim-Karrer. Verhandl. d. Versmm. d. Gesellsch. f. Kinderheilk., Stuttgart, 1906, p. 170.

Berry. Trans. Path. Soc., 1894, vol. xlv, p. 84.

Bertelsmann. Verhand. d. Deutsch. Gesellsch. f. Chir., 1905, p. 163.

Berti. La Pedriatria, 1895, p. 116.

Billard. Die Krankheiten d. Neugeborenen u. Sauglinge Weimar, 1829–37, p. 331.

Bing. Archiv f. Kinderheilk., 1906, vol. xliv, p. 59.

Bittorf. Münch. med. Wochensch., 1906, vol. liii, p. 265.

Bjorksten. Jahrb. f. Kinderheilk, 1902, vol. lv, p. 714.

Borelius. Verhandl. d. Deutsch. Gesellsch. f. Chir., 1905, p. 162.

Bossowski. Przeglad Lekarski, 1899, vol. xxxviii, p. 225.

[1] Sitzungsbericht der Leipziger medic. Gesellschaft, am 20, January, 1903; "A Study of the Intestine," McClurg and Derge, and "Notes on the Resection of Large Portions of the Small Intestine," Evans and Brenizer, Bull. Johns Hopkins Hospital, xvii, 201, December, 1907.

Braun. Verhandl. d. Gesel. d. Naturforscher u. Aerzten Cassel, 1903, vol. ii, p. 143.
Bretano. Verhandl. d. Deutsch. Gesellsch. f. Chir., 1904, p. 265.
Bristowe. Brit. Med. Jour., 1885, vol. i, p. 1085.
Broadbent. Lancet, 1888, February 4, vol. i.
Brook. Brit. Med. Jour., 1905.
Bruning. Deutsch. med. Wochensch., 1905, No. 10, p. 408.
Cahen-Brach. Verhand. d. Gesellsch. f. Kinderheilk., vol. xx, p. 6.
Chapman. Brit. Med. Jour., 1878, vol. i, p. 566.
Cheadle. Lancet, 1886, vol. ii, p. 1063.
Cheadle. Ibid., 1898, vol. i, p. 399
Chiari. Verhandl. d. Deutsch. Patholog. Gesellsch., Breslau, 1904.
Cheinesse. La Semaine Médicale, 1904, p. 369.
Clutton. Trans. Clin. Soc., 1897, vol. xxx, p. 24.
Concetti. Bull. del. R. Acad. Med. di Roma, 1898–99, vol. xxv, p. 787.
Concetti. Archiv f. Kinderheilk., 1899, vol. xxvii, p. 319.
Dagnini. Bull. del. Scienza Med. di Bologna, 1898.
Danzinger. Inaug. Dissert., Göttingen, 1907.
Delkeskamp. Münch med. Wochensch., 1906, p. 166.
Doberauer. Prager med. Wochenschr., 1906, No. 31.
Drew. Lancet, 1905, vol. i.
Duhamel. Inaug. Dissert., Strassburg, 1899.
Dupleix. Bull. del Soc. Anat., Paris, 1877, p. 493.
Duval. Revue de Chir., 1903, vol. xxvii, p. 332.
Ebers. Hufeland's Jour., 1836, lxxxiii, p. 62.
Edsal. Archives of Pediatrics, 1903, p. 936.
Eisenhart. Centralbl. f. Innere Med., 1894, p. 1053.
Eisenschitz. Weiner med. Wochensch, 1906, No. 2.
Elliott. Annals of Surgery, 1899.
Escherich. Mitteil. d. Vereins d. Aerzte in Steiermark, 1901.
Escherich. Berliner klin. Therap. Wochensch., 1906, vol. xiii, pp. 55 to 60.
Escherich. Weiner klin. Therap. Wochensch., 1906, vol. xiii, pp. 61 to 68.
Favalli. Gaz. Med. di. Milano, 1846, vol. v, p. 213.
Fenton. Edinburgh Med. Jour., 1903.
Fenwick. Brit. Med. Jour., 1900, vol. ii, p. 554.
Finizio. Med. Ital. Napoli, 1906, vol. v, pp. 84 to 86.
Fisher. Pediatrics, May, 1901.
Fitz. Amer. Jour. Med. Sci., 1899, vol. cxviii, p. 125.
Fletcher and Robinson. Brit. Med. Jour., 1907, vol. i, p. 370.
Forkel. Deutsch. med. Wochensch., 1905, p. 344.
Formad. Univ. Med. Mag., Phila., 1892, vol. iv, p. 625.
Franke. Verhandl. d. Deutsch. Gesellsch. f. Chir., 1902, p. 262.
Franke. Ibid., 1905, p. 165.
v. Frey. Brun's Beitr. z. klin. Chir., 1896, vol. xvii, p. 123.
Friedheim. Deutsch. med. Wochensch., 1904, p. 1365.
Frommer. Archiv f. klin. Chir., 1902, vol. lxvii, p. 27.
Futcher. Johns Hopkins Hospital Bull., 1900, vol. xi, p. 114.

Fütterer and Middeldorf. Virchow's Archiv, 1886, vol. cvi, p. 555.
Gaume. Revue des Malad. de L'enfance, 1886, vol. ix, p. 155.
Gay. Trans. Path. Soc., 1854, vol. v, p. 174.
Gee. St. Barthol. Hosp. Reports, 1884, vol. xx, p. 19.
Genersich. Jahrb. f. Kinderheilk., 1893, vol. xxxvii, p. 91.
Germer. Deutsch. Zeitschr. f. Chir., 1907, vol. lxxxix, p. 385.
Giordano. Archiv Internat. de Chir., 1903, vol. i, p. 95.
Goodhart. Trans. Clin. Soc. 1881, vol. xiv, p. 84.
Goppert. Archiv f. Verdauungskrankheiten, 1899, vol. v, p. 175.
Gourevitsch. Prager med. Wochensch., 1904, vol. xxix, p. 607.
Graanboom. Nederlandsch. Tijdschrift voor Geneeskunde, 1905, p. 442.
Graetzer. Centralbl. f. Kinderheilk., 1906, No. 1.
Grey. Brit. Med. Jour., 1905, vol. i, p. 33.
Griffith. Amer. Jour. Med. Sciences, 1899, vol. cxviii, p. 283.
Groen. Norsk Magazine for Lægevidenskaben, 1858.
Gruber. Virchow's Archiv, 1872, vol. lvi, p. 432.
Gruneberg. Münch. med. Wochensch., 1901, No. 33.
Gwynne. Quart. Med. Jour., 1902, vol. ii.
Hadden. Internat. Clinics, 1893, vol. iv, p. 48.
Halsted. Archives of Pediatrics, 1893, vol. xiii.
Hand and Stewart. Pediatrics, 1900, vol. ix, p. 123.
Harrigan. Amer. Jour. Med. Sciences, 1899.
Harrington. Chicago Med. Jour. and Exam., 1878, vol. xxxvi, p. 400.
Harvey. New York Med. Record, 1907, vol. lxxii, p. 481.
Hawkins. Brit. Med. Jour., 1907, vol. i, p. 477.
Heimann. Jahrb. f. Kinderheilk., 1904, vol. ix, p. 432.
Henoch. Beitr. zur Kinderheilk., 1861, p. 123.
Herringham and Clark. Brit. Med. Jour., 1894, vol. ii, p. 1240.
Hichens. Lancet, 1898, vol. ii, p. 1121.
Hilbert. Deutsch. med. Wochensch., 1905, vol. xxxi, p. 2035.
Hirschsprung. Jahrb. f. Kinderheilk., 1888, vol. xxvii, p. 1.
Hirschsprung. Festschrift f. Henoch, 1890, p. 78.
Hirschsprung. Berliner klin. Wochensch., 1899, No. 44.
Hirschsprung. Hospital-Stidende, 1899, No. 7.
Hirschsprung. Traité des Maladies de l'Enfance, Grancher and Comby, Tome ii, Paris, 1904.
Hobbs and de Richmond. La Médecine moderne, 1898, vol. ix, p. 652.
Hue. Normandie Méd. Rouen, 1907, vol. xxii, p. 230.
Hughes. Trans. Path. Soc. Phila., 1887, vol. xiii, p. 40.
Hurd. Johns Hopkins Hosp. Bull., 1893, vol. iv, p. 42.
Ibrahim. Deutsch. med. Wochensch., 1905, vol. xxxi, p. 905.
Ito. Jikwa Zasshi, Tokyo, 1907, No. 80.
Jacobi. Amer. Jour. Obstetrics., 1870, vol. ii, p. 96.
Jacobi. Archives of Pediatrics., 1893, vol. x, p. 1046.
Johannessen. Norsk Magazin for Lægevidenskaben, 1900, vol. xv, p. 276.
Johannessen. Revue mens. des Mal. de l'Enfance, 1900, p. 65.
Joukovsky. Med. Obozr., 1903, vol. lix, p. 7.

Kien. Strassbr. med. Zeitung, 1904.
Kinno. Jikwa Zasshi, Tokyo, 1905, No. 64.
Kocher. Mitteil. a. d. Grenzgeb. d. Med. u. Chir., vol. iv.
Kraske. Münch. med. Wochensch., 1906, vol. liii, p. 2418.
Kredel. Zeitschr. f. klin. Med., 1904, vol. liii, p. 9.
Kümmell. Verhand. d. Deutsch. Naturf. u. Aerzte, in Hamburg, 1901.
Lacave. Verhand. van hit Genootschapter Bevood des Geness en Heilkunde te Amsterdam, 1885, vol. ii, p. 7.
Lambrior. Bull. Soc. d. Med. et Nat. de Jassy, 1906, xx, p. 209.
Langmead. Trans. Clin. Soc., 1906, vol. xxxix, p. 48.
Lengemann. Verhand. d. Deutsch. Gesellsch. f. Chir., 1907.
Lennander. Nord. med. Archiv, 1900, vol. xi.
Lespinasse. Jour. de Méd. de Bordeaux, 1888–89, vol. xviii, p. 427.
Levi. Archives of Pediatrics, 1903, vol. xx, p. 935.
Lewitt. Med. Jour. of Chicago, 1867, vol. xxiv, p. 359.
Linck. Inaug. Dissert. Königsberg, 1906.
Little and Callaway. Trans. Path. Soc., 1850–51, vol. iii, p. 106.
Löwenstein. Centralbl. f. Allg. Path., 1907, vol. xviii, p. 929.
Marchand. Münch. med. Wochensch., 1903, p. 351.
Lunn. Lancet, 1899, vol. i.
Marfan. Traité des Maladies de l'Enfance. Grancher-Domby, 1897, vol. ii.
Marfan. Rev. mens. des Malad. de l'Enfance, 1895, vol. iv.
Martin. Montreal Med. Jour., 1897, vol. xxv, p. 697.
Money and Paget. Lancet, 1888, vol. i, p. 221.
Miwa. Jikwa Zasshi, 1900, No. xx.
Morris. Brit. Med. Jour., 1886, vol. ii, p. 1211.
Muhlberger. Zeitsch. f. klin. Med., 1905, vol. lvii, p. 374.
Murakami. Jikwa Zasshi, Tokyo, 1905, No. 65.
Murakami. Ibid., 1907, No. 81.
Murray. Annals of Surgery, 1903, vol. xxxviii, p. 736.
Mya. Lo Sperimentale Sex. Biolog., 1894, p. 215.
Navarro. Primera Reunión del Congr. Científico Latino-Americano, Buenos Aires, 1898.
Neter. Archiv f. Kinderheilk., 1901, vol. xxxii, p. 232.
Neter. Münch. med. Wochensch., 1907, p. 1817.
Neugebauer. Archiv f. klin. Chir., 1907, vol. lxxxiii, p. 503.
Nikolaysen. Norsk. Mag. f. Lægevid., 1900, p. 269.
Oestreich. Berl. klin. Wochensch., 1893, p. 852.
Osler. Johns Hopkins Hosp. Bull., 1893, vol. iv, p. 41.
Osler. Archives of Pediatrics, 1893, vol. x, p. 113.
Oulmont. Bull. de la Soc. Anat. de Paris, 1843, vol. xvii, p. 336.
Parry. Collections from the Unpublished Medical Writings of the late C. H. Parry, London, 1825, vol. ii, p. 380.
Peacock. Trans. Path. Soc., 1872, vol. xxiii, p. 104.
Pennato. La Clinica Med. Ital., 1902, p. 13.
Perthes. Archiv f. Chir., 1905, vol. lxxvii, p. 1.
Petrivalsky. Casop. lek. Cesk. v. Praze., 1907, vol. xlvi, p. 457.
Pfisterer. Jahrb. f. Kinderheilk., 1907, vol. lxv, p. 160.

Pippingskold. Finska lakaresalls kapetohandlingar, 1880, vol. xxii, p. 410.
Pitt. Trans. Path. Soc., 1895, vol. xlvi, p. 66.
Pluyette. Marseille Medicine, 1905, p. 241.
Polis and Roersch. Annales de la Soc. Méd. Chir. de Liège, 1893, vol. xxxii, p. 218.
Rampold. Wurtemb. Corresp.-Blatt, 1847, vol. xvii, p. 35.
Rehn. Centralb. f. Chir., 1901, p. 1200.
LeRoy des Barres. Gaz. des hôp., July, 1903.
Revilloud. Gaz. des hôp., 1877, No. 75.
Richardson. Trans. Amer. Surg. Assoc., 1897, vol. xv, p. 585.
Richardson. Boston Med. and Surg. Jour., 1901, vol. cxliv, p. 155.
Reider. Fortschr. a. d. Geb. d. Rontgenstrahlen, vol. viii.
Riether. Wiener klin. Wochensch., 1898, p. 77.
Rolleston and Howard. Trans. Clin. Soc., 1896, vol. xxix, p. 201.
Roser. Verhand. des 4th. Chir. Congress, Berlin, 1875, p. 3.
Rotch. Pediatrics, The Hygienic and Med. Treat. of Children, Phĭlaḋelphĭa, 1896, p. 875.
Roth. Archiv f. klin. Chir., 1906, vol. lxxxi, p. 125.
Roux de Brignoles. Gaz. Méd. de Paris, 1903, No. 40.
Schlange. Verhand. d. Deutsche Gesell. f. Chir., 1905, p. 165.
Sakamoto. Med. News (Japanese), 1907, No. 672.
Schreiber. Archiv f. Verdauungskrankheiten, 1907, vol. xiii, p. 101.
Schuckmann. Deutsch. med. Wochenschr., 1907, vol. xxxiii, p. 127.
Schukowski. Med. Rundschau (Russian), 1903, H. 7.
Shiota. Med. News (Japanese), 1906, No. 716.
Silberberg. Centralb. f. d. Grenz. Med. u. Chir., 1903, vol. vi, p. 881.
Stewart. Archives of Pediatrics, 1900, vol. xvii.
Stirnimann. Corresp.-Blatt f. Schweizer Aerzte, September 15, 1905.
Tarozzi. Rifor. med., 1902, Nos. 188 and 189.
Tattel. Wiener klin. Wochensch., 1901, p. 903.
Tordeus. Jour. de Clinique et de Thérap. infantil, 1902, Nos. 188 and 189.
Treves. Lancet, 1898, vol. i, p. 276.
Treves. Intestinal Obstructions, N. Y., 1902, p. 242.
Torikata. Jikwa Zasshi, 1906, No. 75.
Tschernow. Jahrb. f. Kinderheilk., 1906, vol. lxiv, p. 811.
Valagussa. Rev. di Clin. Pediatric, December, 1903.
Van der Kolk. (Cited by Hurd.)
Vulpian. Gaz. des hôp., 1877, No. 75, p. 593.
Walker and Griffiths. Brit. Med. Jour., 1893, vol. ii, p. 230.
Wallmann. Virchow's Archiv, vol. xiv, p. 202.
Walsh. Northwest Lancet, vol. xiii.
Walther. Bull. de la Soc. Anat. de Paris, 1888, p. 257.
Warashino. Jikwa Zasshi, 1904, No. 47.
White, Hale. Albutt's System of Med., vol. iii, p. 967.
Wilms. Münch. med. Wochensch., 1905, p. 2061.
Woolmer. Brit. Med. Jour., 1899, vol. i, p. 1330.
Zenoni. Bull. della Assoc. Sanitar., Milanese, 1902, No. 6.
Zesas. Fortschritte der Med., 1906, No. 2.

DISCUSSION.

Dr. Leonard Freeman, of Denver, Colorado.

I wish to mention the case of a young man (seen with Dr. C. K. Fleming) with a very pronounced type of Hirschsprung's disease, who had been troubled with constipation ever since he could remember. As long as three months sometimes elapsed without a movement of the bowel. In fact he never had a movement without special measures being taken. At operation, at which I assisted, the colon was found to be enormously dilated below the splenic flexure, the distention involving the rectum almost to the anus. It was evidently impossible to make an anastomosis, and at my suggestion we plicated, replicated, and replicated the surface of the large intestine until it was reduced in size to something like normal. We did not notice the enlargement of the mesentery, of which Dr. Finney speaks. The condition was much improved when I heard of him some months later. Sometimes he would have a voluntary movement of the bowel, and always with the help of an enema. I then lost sight of him, but have an indefinite report that his condition is reasonably good. I should not advise the plication of the intestine for an ordinary case, but in this instance it served a purpose, and seemed to be the only thing possible.

PELVIC ABSCESS, WITH SPECIAL REFERENCE TO RECTAL DRAINAGE.

By ARCHIBALD MacLAREN, M.D.,
ST. PAUL, MINNESOTA.

THE problem of how to deal with pus in the pelvis has been practically solved in so far as the woman is concerned; all intraperitoneal collections of pus—with the exception of tubercular inflammations—whether from cellular tissue, appendages, uterus, or appendix, can be cured by vaginal section in the vast majority of cases.

My experience is drawn from the histories of 210 pelvic abscesses treated by vaginal section, reported in *St. Paul Medical Journal*, of January, 1908. Of this number, 20 were recognized at the time of the original operation as due to suppurative, perforative appendicitis, and nothing was done at the time of the original operation but to open and drain the abscess through the vagina, leaving the appendix to be dealt with at some subsequent time. In three of these cases the appendix continued to give so much trouble that it was removed in the next ten days. All of these 20 appendical cases recovered. My further observation has been that not more than 20 per cent. of all pus cases, including pus tubes and suppurating ovarian cysts, need more than a single vaginal section with tube drainage; and that very few cases, comparatively, find it necessary to have a later laparotomy and removal of appendages; and that at least 5 per cent. of the large pelvic abscess cases are so perfectly cured that they have later been successfully delivered of living children.

In the pelvic abscess of men we have a slightly different problem,

for here, to reach and drain Douglas' cul-de-sac, we must go through the anterior rectal wall. The fear of increasing the infection, or of further contaminating the abscess cavity, has held the surgeon back, and prevented for several years his offering the man with a pelvic suppuration the same chance that he would the woman. I can recall many cases of pelvic appendical abscess in men and boys that have been opened and drained in both sides and in both loins, as well as having suprapubic stabs for large glass or metal tubes, who in spite of all these drainage tubes have died. These patients have died of chronic sepsis or amyloid liver because, for one reason, they have not had drainage of the dependent portions of the peritoneum. On several occasions I have expressed the theory that many of these patients died because the abscess wall had been broken up for the purpose of removing the appendix. I am now inclined to change this opinion, and to conclude that it was because of the presence of pockets of pus imperfectly drained, and that these pockets are usually in the pelvis. These patients are, as a rule, very sick; they do not stand operations well; so that I would still feel that it is unwise to try to remove the appendix in the presence of any quantity of pus.

We all know that, if the abscess be left to itself, and if the patient does not die in the process, a certain number will rupture into the rectum and cure themselves; now, when we, as surgeons, step in and take off the pressure in this abscess cavity by opening it from above, we lessen the chances of nature's best cure. It was Dr. Jepson, of Iowa, if I remember correctly, who described a method of drainage to meet this difficulty; after opening an abscess case in the right McBurney point, with the finger inside to guide him, he makes an opening into the anterior peritoneal cul-de-sac beside the bladder and outside of the ureter, close to the rames of the pubes, and puts in a tube drain. The objection to this method which I would make is, that it does not drain the most dependent portion of the peritoneum, that there is too much tissue disturbed, and that rectal section is a much easier and better method.

These pelvic abscesses which we are here discussing are practically all due to perforative appendicitis. Of course, we may have

abscess following perforation, but the vast majority will follow acute perforative appendicitis.

If we might be so fortunate as to see and recognize all acute cases of appendicitis before rupture of the appendix, this question would not need to be so important. But after rupture the omentum and the adhesive peritonitis usually wall off the pus and keep it in the right loin. The edge of the pelvic cavity is very near, and in many cases the pus runs over into the true pelvis, at the time of the original rupture. Many others extend into the pelvic cavity in the next few hours or days.

I am fully impressed with the importance of examining through the rectum every case of acute appendicitis before any operation, for it is very important that the pelvic accumulation should be drained at the time of the first operation with a suprapubic drain, followed by the Fowler position—reserving rectal drainage for the cases who later develop pelvic accumulations or who convalesce badly after any course of treatment; at least, this is the class of cases in which I have felt that it was justifiable to take some risk and try a new departure. Since starting to write this article I find that this subject has been favorably discussed of late in Paris, and that Dr. George McNaughton, of Brooklyn, advised it in January, 1906, saying that it was a fairly safe avenue of approach in pelvic abscess in men, although he does not give any histories.

And what is the danger from rectal drainage? None at all, according to a limited experience. In my first case, seen with Drs. H. C. and Asa Johnson, of St. Paul, I simply made a rectal puncture, opening into the rectum a moderate sized abscess, which discharged several ounces of pus. The opening closed too soon, but later opened and discharged a pint of offensive pus, when the man promptly recovered and has remained perfectly well, now over six months.

In the next case I followed the advice of my friend, Dr. Arnold Schwyzer, of St. Paul, and overdistended the sphincter, so that there would be no back pressure from the rectum in the abscess cavity, and put in a winged rubber tube, which extended a couple of inches from the anus, and left this in place over a week.

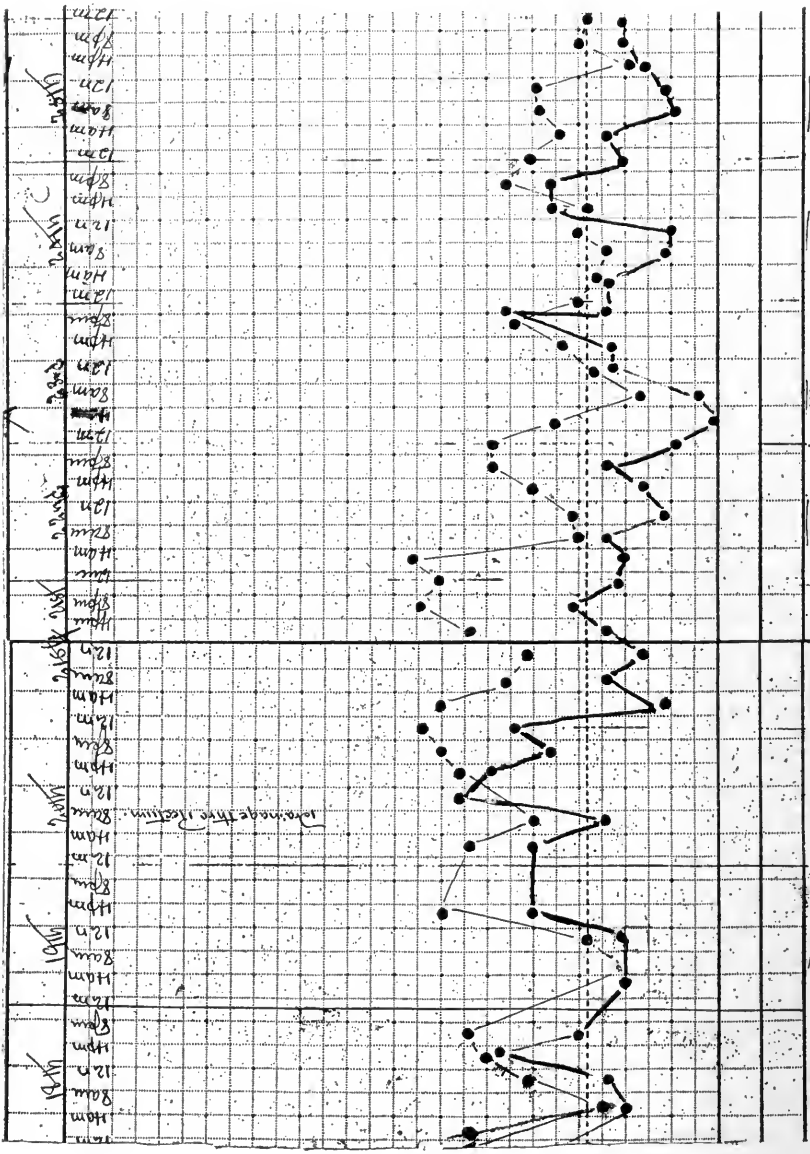


CHART I.

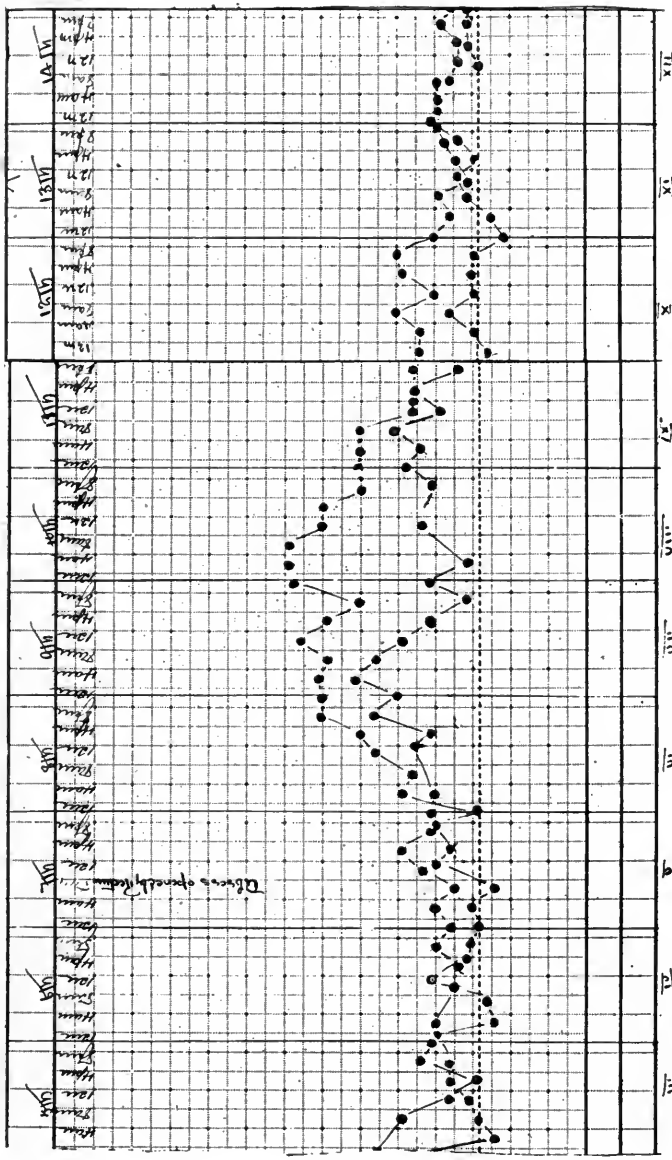


CHART II.

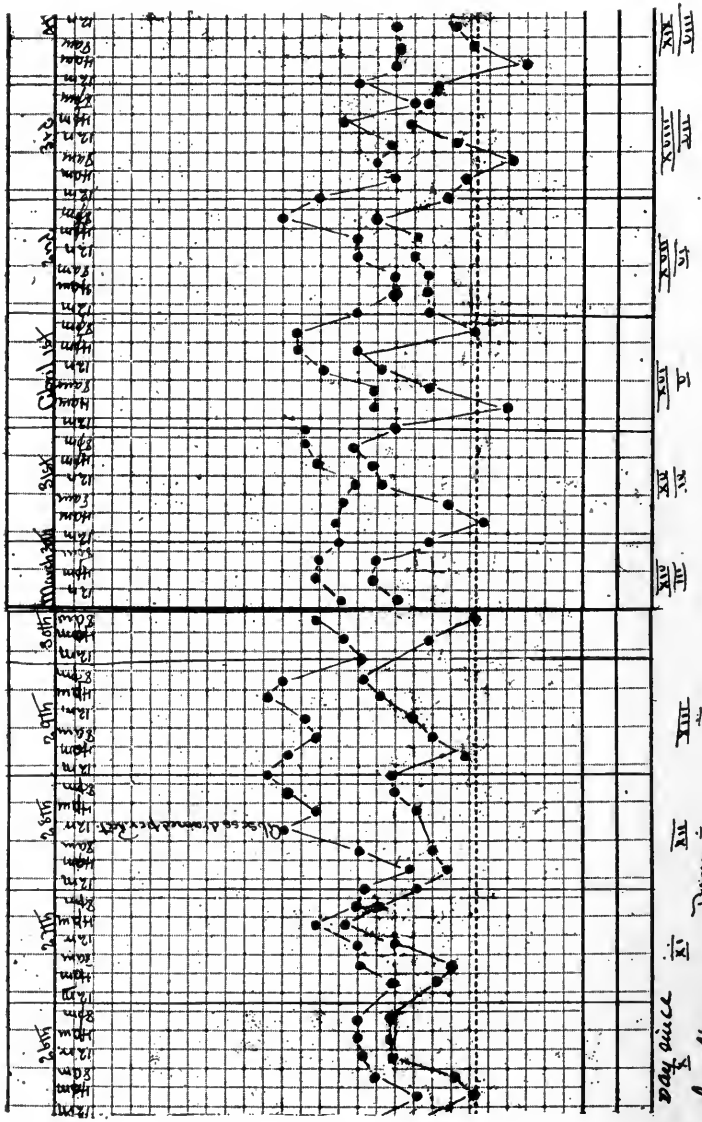
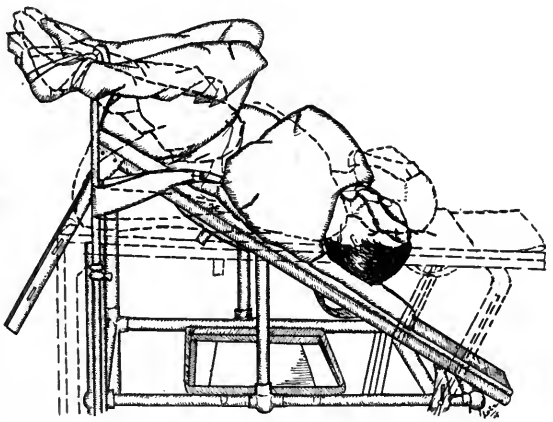


CHART III.

In the third case, a patient of Dr. Keams, of St. Paul, I first opened the base of the bladder by mistake in a man very sick with acute septic peritonitis, and put my finger well into the bladder to be sure that it was the bladder, and left it open, then immediately opened the cul-de-sac and put in a tube. The same night the man passed bloody urine through the urethra, but had no inflammation or other bladder trouble. He later coughed up pus from a ruptured subdiaphragmatic abscess, and eventually recovered perfectly.



Pryor position.

The fourth case, a boy aged twelve years, sent by Dr. Kerr, of Martel, Wisconsin, was operated upon on the sixth day. On the tenth day of his disease I found a bulging of the anterior rectal wall and made a rectal section, letting out fully three ounces of thick, offensive pus. There was considerable bleeding from the rectal wall, and that night he showed that he had lost quite a little blood. For several days his temperature and pulse were high, due to a blood infection, and the drainage tube gave exit to considerable black blood. He was slower than any of the others, but is now perfectly well.

In Case V, I assisted my partner, Dr. H. P. Ritchie, to operate upon a very sick man on the third day after perforation; on the tenth day Dr. Ritchie put a drain in the rectum. This

man stayed disturbed and bad for a long time, but in the end recovered perfectly.

And now, as to the method of procedure: The exaggerated lithotomy position (Pryor), the one usually used in making examinations of female bladder with the cystoscope. The most important part of this position is the use of straps over the shoulder, fastened to the uprights holding the feet, to prevent the shoulders slipping away when the head of the table is dropped. I have found that a weighted vaginal speculum will expose the anterior wall of the rectum fully as well as is usually done in the similar operation for vaginal section.

One long-bladed retractor for the anterior wall is necessary to hold the bladder out of the way. The bladder having been catheterized to prevent accident (a thing I omitted to do in the case related), then irrigate the rectum until fecal matter is removed, then sponge it out with alcohol. After the rectum has been well cleaned and the bulging anterior wall well located, open the abscess with either long dissecting forceps or a tenaculum and long, sharp-pointed scissors; after opening the cul-de-sac and letting out the fluid, keep the scissors in place until a dilator can be passed upon them as a guide; then keep the dilator in place until one can pass a quarter-inch rubber winged tube well up into the cavity, then again dilate the sphincter.

My attention has lately been called to a combination trocar and dilator for use in vaginal puncture. There are comparatively few vessels in the posterior vaginal wall, but, as is shown in Case IV, there is some danger of hemorrhage following rectal section, more, I am sure, than in vaginal section, so that I am inclined to believe that in these cases the lesser procedure of rectal puncture would be the operation of choice.

Vaginal puncture I do not like; it is too blind and does not give sufficient room for further exploration, but in these cases all that is necessary is an opening through which to pass a drainage tube.

It has been a great pleasure to see the relief and comfort which these patients have received from rectal drainage, and to note the rapid drop of temperature and pulse which followed this very insignificant operation.

DISCUSSION.

DR. ELLSWORTH ELIOT, JR., of New York.

I have seen several cases drained by the rectum as the result of Nature's effort to establish drainage. In these the opening was established between the abscess cavity and the large intestine. In most of the cases the result has been satisfactory both in regard to the drainage of the abscess cavity and the closure of the opening. In those connected with the large bowel above the rectum a fecal fistula has occasionally followed. I have had some experience with drainage through the vagina, particularly in cases associated with pelvic abscess arising from disease of the tubes, and also in abscess associated with disease of the appendix. Although in a number of instances this drainage has been quite satisfactory, in a considerable number a secondary operation through the abdomen has been necessary because of re-accumulation of pus. My larger experience has been with suprapubic drainage, with invariably satisfactory results.

DR. STANLEY STILLMAN, of San Francisco, Cal.

It seems to me that in considering cases of collections of pus in the pelvis it is important to distinguish between those which arise in connection with the tubes or appendix and those which are due to gravitation of fluids, which sooner or later become purulent, as in late cases of appendicitis, which Dr. Murphy has been so fortunate as not to have encountered. I believe that it is always best, in dealing with cases coming under the first head, to reach the abscess through the anterior abdominal wall rather than through the rectum. It has been my custom for a number of years, however, to drain secondary abscesses which have resulted from a primary affair elsewhere in the abdomen, by incision or puncture through the rectal wall in the male when fluctuation can be detected, and I have never seen anything but satisfactory results from such treatment.

DR. RICHARD H. HARTE, of Philadelphia.

I recall the case of a man now in my ward. He was desperately ill, and it was impossible to make a diagnosis except that he had some pelvic collection of pus, from what source I did not know. Pain was referred to the left side, and it was first thought there might be a prostatic abscess. The speculum was placed in the rectum and a large abscess was located posteriorly, from which was drained from a pint and one-half to a quart of pus. The man is now convalescent. That the method is rather one of blind surgery it must be admitted, but it

undoubtedly is a valuable method of dealing with certain cases. It should not, however, be employed in all cases of accumulations of pus.

Dr. MacLaren. I think when the abscess opens itself there is much more likely to be a fecal fistula, because it often opens at the top when the drainage will be bad. If opened by the surgeon the drainage is perfect. I am glad to have heard of Dr. Stillman's method and results. A great many secondary operations have to be done for large pelvic abscesses in the groin, but that is a different proposition. This method is not suitable for all cases. As Dr. Harte has said, it is blind surgery, but it becomes less blind with experience. If you feel through the vagina a collection of pus, you know it is there; and the same is true in regard to the rectum. I have made it a rule in cases of septic peritonitis never to allow a woman to die without making a vaginal section, because I have gotten some of the most remarkable results from making a simple vaginal section in these very desperate cases. Another rule I have now made for myself is not to let a man die without putting a tube into the cul-de-sac through his rectum.

MODERN MEDICINE AND SURGERY IN THE ORIENT.

By JAMES EWING MEARS, M.D.,
PHILADELPHIA.

A RECENT visit to the Orient has afforded me the opportunity to study modern scientific medicine as it exists there to-day. Through the courtesy of members of the medical profession and others, I was permitted to make extended observations of the conditions which are present, and which have exerted a dominating influence in the development and growth of scientific medicine in the East. I have chosen to speak of "Modern Medicine and Surgery in the Orient," and not of ancient, empiric medicine, as the history of medicine tells us it existed from the earliest recorded period of time. In the paper which I read before the Association, at the meeting at St. Louis, in 1904, on the "Evolution of Surgery," I directed attention to the practice of the art of surgery at that time, when it existed as an art, and not as a science, and in considering the evolution, or the unfolding of surgery, I endeavored to show that this was accomplished by a gradual ingrafting of the science, influenced greatly by important controlling factors, most importantly by the cultivation of human anatomy, so auspiciously begun in the great school of Alexandria three hundred years before the Christian era, inspired by the instruction of Herophilus and Erasistratus, the first anatomists who dissected and described parts of the human body. Following in order, comparative anatomy, physiology, pathology, chemistry, and therapeutics were brought to make their contributions to the growing science, broadening the fields of investigation and determining its scope.

In the beginning, the art of surgery was advanced to quite a

high degree in some parts of the Orient, notably among the Hindus, where such important surgical operations as lithotomy, herniotomy, abdominal section, with intestinal excision and suture, Cesarean section, extraction of cataract, plastic operations for restoration of the nose, were undertaken; fractures and dislocations were treated and differential diagnosis elaborated; constitutional treatment was instituted in surgical cases; numerous surgical instruments were designed and manufactured, most of which are in use today.

From this beginning in the East medicine came into the West, was developed by teaching and authorship, and as well by individual attainment, by the systematic courses of instruction in the school of Alexandria, and the genius of Galen, of Celsus, and of Paulus, of Egina; elaborated, as it stepped upon the Continent of Europe, by the erudite Hippocrates, whose treatises in the "Hippocratic collection" are encyclopedic in character, perfect models in descriptive precision, giving evidence of original investigation, of accurate observation, of knowledge, and of skill gathered in fields of wide experience; expounded in the great universities of Salerno, of Padua, of Naples, and of Bologna, that of Padua giving to the world William Harvey, the discoverer of the circulation of the blood, a student in anatomy under the illustrious Fabricius. Progressing across the continent, it found exposition in the Universities of Paris and of Lyons, and, crossing the channel, reached the portals of the University of Edinburgh, where clinical medicine and surgery came into existence, methods in teaching which, in their far-reaching influence, were the most important contributions which had been made up to that time, and which have determined, to this day, the character of medical instruction the world over.

To our country the University of Edinburgh gave instruction in medicine, through Dr. John Morgan, a graduate, who in 1765 founded the Medical College of Philadelphia. This college, continued in direct succession, is in full development, the Medical Department of the University of Pennsylvania.

As a science, medicine returns today to the Orient expanded,

purified, refined, made what it is by the genius of Virchow, of Pasteur, of Koch, and of Lister, who, as illustrious disciples of their noble profession, have made such eminent and valuable contributions whereby suffering humanity finds relief. Into the hands of the intelligent physician they have placed goodly weapons with which to wage the never-ending warfare against disease and pestilence, have made it possible for enlightened communities to anticipate the impending contagion, and by the timely adoption of well-defined measures and the use of agents, the value of which have been accurately determined, render harmless its attacks.

To the efforts of these great promoters of modern medical science should be added the results obtained by the patient and painstaking labors of the original investigator in the laboratory and in the institute for research, who, unmindful of the luxurious rewards of wealth, with self-sacrificing zeal and well-trained intellect, spends his life in unremitting toil, to extract truth from refractory nature, to contribute knowledge to the common stock, and to make good the statement that in the fifty years past "the world has learned more of truth available for the improvement of man's stay on earth than was known in the thousands of years between the dawn of creation and the middle ages." And thus, the science of medicine, with other sciences which, in this fleeting half century, have so profoundly influenced the life conditions of the world, has passed on to the ancient and crumbling civilizations of the East, following closely in the wake of the trader seeking commercial opportunities, and hand in hand with the devoted missionary, bearing messages of love, of faith, and of hope inculcated by the Great Physician and Healer. Together they have penetrated the innermost parts; have quickened the stagnant thought and awakened the dormant energies of China; have regenerated Japan, engrafting upon conditions of life engendered by the feudal state, intellectual, social, and political, the energizing influences of Western civilization. In India, they have torn asunder the time-honored, self-satisfying tenets which controlled their schools of philosophy, and uncovered to the gaze of the world the mystic elements of their cults.

To comprehend the position of modern scientific medicine in the Orient, we must have knowledge of the institutions engaged in teaching the science, the methods of instruction employed in theory and practice, their equipment with all of the appliances for the successful conduct of laboratory and research work, the provision for extended clinical instruction, the attainments of the teachers, and the place they occupy in the world of science. In Japan, the country I visited first, this knowledge was not very difficult to obtain. Education in medicine is there a part of the general system, which is as complete in its development as may be found in any country of the world. The educational centre is Tokyo, the seat of government since 1590, and the residence of the Mikado, or Emperor, since 1868, when he left Kyoto, where he had been a virtual prisoner and deprived of his imperial rights and privileges by the Shogunate, the head of which was the Shogun, who, with his great feudatories, his armed retainers, and well-filled exchequer, had ruled the Empire. The act of interference by the United States Government in 1853, when Commodore Perry, with his fleet, sailed into the harbor of Yokohama and demanded, on the part of his Government, the abandonment of the policy of isolation practised by Japan, gave the final blow to the Shogunate and restored the Mikado to the absolute power which had belonged to his ancestors centuries before.

In Tokyo one of the two great universities of Japan is located; the other is in Kyoto. That in Tokyo consists of six colleges—of law, medicine, engineering, literature, science, and agriculture; students come to the university not only from all parts of Japan, but also in great numbers from China. At the time of my visit I was told that there were some 15,000 Chinese students in attendance in the educational institutions of Tokyo. This fact is significant when considered in connection with the increasing influence exerted by Japan in the affairs of China, and of the possible effect this may have upon her future.

Of the one hundred and thirty-one Professors in the University, the College of Medicine has twenty-four, with four to five hundred students, who pay a tuition fee each year of fifty yen—twenty-five

dollars. The prescribed course of instruction covers a period of four years, and the students are divided into four classes. The curriculum includes all of the branches of medicine, those fundamental being assigned, as is usual and necessary, to the first years, and the practical courses coming in the last, with instruction in hospital wards and in the clinical laboratories. There are two hospitals connected with the work of the college, having a total capacity of 571 beds. The material for clinical instruction is very large, and the two operating rooms, which seat 300 students each, are examples of the most modern methods of construction, supplied with all of the requirements for perfect aseptic operative procedures.

As the early instructors in medicine were Germans, the teaching is German in character. Some of the lectures are delivered in the German language, and the text-books are largely German or translations from that language. The library is large and supplied with volumes on all of the subjects of medicine, many in the English language, among them a number of American text-books.

In addition to the College of Medicine of the University, there are in Japan eight other medical colleges. These institutions do not possess the authority to grant licenses to practise; the graduates are required to pass a satisfactory examination before a Special Board of Medical Examiners before they receive permission to practise. In these institutions the standard of instruction is of the best character, equal in every respect to that of the University Medical College. Foreign physicians who are graduates of medical colleges having a reputable standing will, on application, be granted a license to practise.

There are a number of hospitals in Tokyo outside of those connected with the medical colleges; most, if not all of them, have a training school for nurses, the courses of instruction in which extend over a period of two years. The outdoor clinics or dispensary services are crowded each day by the poor who are in need of medical treatment. In the Tokyo Charity Hospital, with 150 beds, there is a training school for nurses, with 85 pupils. The army hospital is the largest in Tokyo, having 500 beds; in

this hospital the nursing is done by the soldiers, who receive special training for this service.

The hospital considered the best in Tokyo is that of the Red Cross Society, with a capacity of 250 beds, a staff composed of the best physicians in the city, and a corps of 260 nurses, more than one nurse for each patient. This excess in the number of well-trained nurses insures effective service and gives a deserved reputation to the hospital.

Red Cross Hospital, Tokyo.

My friend, the late Dr. Senn, to whom I was greatly indebted for cards of introduction to the prominent medical men of Japan, and from the account of whose investigations I learned much of the condition of scientific medicine in the East, has spoken in this way of the Japanese nurse: "The Japanese women, by birth, nature, and training, are admirably adapted for the care of the sick. Their graceful stature, the innocent, sympathizing expression of their eyes, their small, delicate hands, and their light, noiseless gait are qualities which go far to make them ideal nurses. Each candidate for the training school connected with the Red Cross Hospital must have a good elementary education, and is subjected to a thorough physical examination. The age limits are from eighteen

to thirty years, and for military service from twenty to forty years. The nurses in the Red Cross Hospital receive the most practical kind of instruction by lectures and demonstrations. They are made nurses and not half doctors, as is the case with many of our training schools. They serve an apprenticeship of three years, and on passing a satisfactory, rigorous examination, receive the necessary credentials which entitle them to enter private practice. A graduated nurse in private practice receives from one yen (50 cents) to a yen and a half (75 cents) a day—quite in contrast with what our nurses are accustomed to charge for their services when on duty. A gilt maple leaf is the insignia of a graduate nurse from this institution, while the small Red Cross on the front of the high white cap is common to the graduate and undergraduate nurse. In the operating room the anesthetic, usually chloroform, is administered, by the drop method, by a graduate nurse, supervised by one of the surgical assistants. The nurses make the necessary preparations for the operation and handle the instruments and dressing material. The gauze sponges are sterilized in a tube-like tin box with a closely fitting cover. The nurse opens this box, grasps the sponge with an aseptic forceps, and with this instrument hands it to the operator. As soon as a Japanese young woman is accepted as a pupil she leaves behind her native dress, which is exchanged for a white dress, and the wooden sandal or clog gives way to the noiseless straw sandal. In case of war, the Red Cross nurse, when ordered to duty, wears a black dress and a white cap."

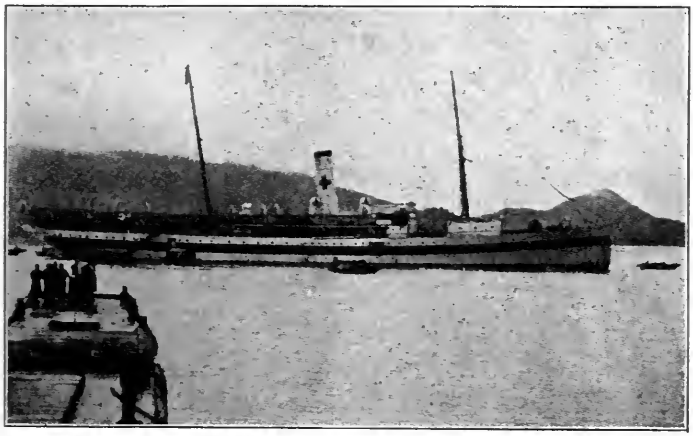
This is, indeed, a pleasing picture of the attractive qualities of the Japanese women which would make them ideal nurses, and I hesitate to say aught which would cloud its coloring or disturb the harmonious blending of its tints. I think, however, that it has not been so painted by some who have gone among the Japanese people, have observed their characteristics, and become acquainted with their social conditions. There are no people in the world who claim a civilization above that of the barbarian so bereft of emotions as are the Japanese; they are trained in a school of rigid repression of such attributes of the mind and heart. The

obeisance of recognition, which, when made to a superior in social position, brings the woman to the floor, on bended knees and with cringing body, does not express any sentiment save that of abject servility. Between father and mother, husband and wife, sister and brother there is no conduct which betokens parental, conjugal, or filial love and affection. Wifely respect and homage to the husband and father, and filial obedience, are so unyielding, that with joy and gladness, encouraged and supported by the hearty approval of family, relatives, and friends, the young daughter, budding into womanhood, consigns herself to a life of shame, at the behest of the father, to relieve him of financial embarrassment. Obedience to the command of the father and of his male descendant and his successor, the oldest son, as the unchangeable head of the family, is regarded and classed as a cardinal virtue, and has been cultivated as such from time immemorial. So incomprehensible is the conception of morality by these people, and so much at variance with that entertained by people imbued with the principles of a Christian civilization, that no disgrace attaches to any violation of the moral law. To such extent does this exert a controlling influence that the inmate of the Yoshiwara (the quarter of the city inhabited by the licensed prostitutes) may be taken out to become the respected wife of one in her social class. This fact was told to me by a lady who, in her missionary experience, knew of such instances, and inspired by the highest motives of duty to a fellow being, who could claim forgiveness, because "she knew not what she was doing," had assisted in the work of reclamation.

In no other part of the world is the Red Cross Society so perfectly organized or so efficiently equipped for rendering service to the sick and wounded of the army and navy in the time of war and in the time of public calamity to the people, as when earthquakes, eruptions, inundations, hurricanes, shipwrecks, railway disasters, etc., occur. The society owns two hospital ships, which are placed in service to take care of the sailors, and are also used for transportation of the sick and wounded of both systems of the military service, army and navy. During times of peace these ships are leased to a transportation company, subject to immediate

release from this service when needed. The revenue received in this way contributes to the building of other hospital ships. The storerooms of the society are filled with articles and appliances which may be needed in the performance of the most important duties of those in charge of the work of the society in the field or on board of the hospital ship.

An Imperial Prince is the Honorary President of the society, and the membership is 900,000, making it the largest in membership in the world and, as well, the richest. The income in 1903 was over 2,965,300 yen, or $1,482,650. A large corps of surgeons and trained nurses are ready to report at short notice, and when they are on duty are under military control.



Red Cross Society Hospital Ship.

A card of introduction to Baron Hashimoto, one of the retired surgeon-generals of the Imperial Japanese army, and very active in promoting the work of the society, opened the doors of the hospital to me and gave me the pleasure of meeting him. A lady friend—Miss Annie West—a missionary of twenty-five years' noble service in the calling she had chosen for her life's work, who during the Russo-Japanese War had rendered such faithful and useful services in the hospital as to commend her to the Empress as worthy of an Imperial decoration, which she received, was my

guide through the hospital, in company with members of the staff of resident and visiting surgeons.

Japan has a well-equipped school for the instruction of its military medical officers. Young graduates in medicine who desire to enter the military service are received, after passing the physical examination required, into this school. They are placed under military discipline, and are instructed in their duties as

Blind masseur, Tokyo, Japan.

officers of the medical service. At stated times all of the surgeons in the military service must take postgraduate courses, covering a period of four months in laboratory instruction and in clinical demonstrations.

Massage, the practice of which is of such value in medical and surgical conditions, is not only employed in the hospitals, where it is given by the trained nurses, but is practised generally among the

Japanese people. During the night blind masseurs and masseuses, feeling their way through the streets of the towns and cities, with their staves striking upon the stones in rhythmical movements, accompanied by the sounds made by their wooden clogs, attract the attention of the residents by a plaintive call or a peculiar whistle. Called into the houses, they administer massage, charging a trifling fee for the service rendered, thus making it possible for the poorest class of people to enjoy the benefits of a "rubbing." The "riksha" puller, after a day's labor, equal to that performed by the horse, indulges regularly in this method of treating stiffened joints and exhausted muscles. So with the coolie, whose labor is so arduous and unremitting. The opulent merchant uses it as a luxury and needful frequently as a stimulating fillip to a sluggish condition of the superficial blood movement of the trunk and extremities.

It is interesting to know that massage was brought into Japan by the Malays at the time of predatory invasions, when they left not only some of their peculiar customs, but gave, it is believed, by racial intermingling, ethnologic types.

Bathing is universally indulged in by the Japanese in water the temperature of which is from 110° to 125°. The bathtub is usually built in the form of a tank made of wood, varying in size according to its uses in the home, inn, or public bath-house. The water is heated in a very primitive way by the introduction at one end of the tank of a small stove. Formerly in cities, as well as in villages in the provinces, promiscuous bathing of the sexes, devoid of bathing suits, was the custom; lately it has been forbidden in the cities, but is still practised in the country districts. In the villages the tank may be placed on the sidewalk in front of the houses, on the porch, or in the open space about the house. In the absence largely of running water, the tank, when once filled, does duty for indefinite periods, and to large and small numbers of persons. Soap is not used in the public baths, but is applied outside. Owing to the continuous use of the public bath, the charge, at all times very small, is decreased in proportion to the use and the condition of foulness of the water.

While the labor of the barber in Japan is not so arduous and constant as that of his colleague in China, owing to the custom which prevails there of shaving the head and arranging for the queue, it is possibly more varied in that he is called upon to render service to the female sex as well, who have, when married, their eye brows and superfluous hairs on different parts of the body removed by the razor, and their teeth blackened with the juice of the persimmon tree. In the barber shops the employees are dressed in loose white gowns, and have placed over the mouth close-fitting pieces of gauze, which protect the occupant of the chair from exhalations which are sometimes very offensive, and, possibly, dangerous.

The conditions which accompany the much vaunted custom of bathing, whereby the Japanese claim credit for habits of cleanliness not practised by other races of the Orient, would seem to indicate an absence of consistency in the practice, which is hostile to faithful adherence to hygienic principles and sanitary regulations.

I feel I cannot better conclude the account I have given of what scientific medicine has achieved in Japan, as is manifested in the institutions organized and conducted for the education of students in medicine, equal if not superior to many of those existing in parts of the world the people of which are disposed to boast of the great advantages they enjoy from the conditions which belong to the civilization of the West; in the great results obtained in the relief of human suffering in their well-equipped and well-managed hospitals; in their military medical schools and hospitals; in the perfect organization and conduct of the Red Cross Society, than to speak briefly of what is being done in promoting the conservation of the public health, and of the work of the Tokyo Imperial Hygienic Institute, an institution which has been designated "the crowning point and pride of medical science in Japan." A card of introduction gave me admission and permitted me to spend several hours in the company of the founder and director in charge—Professor Kitasato—a most accomplished scientist, and his assistants, who afforded me every opportunity to inspect the institution and learn of its work. After graduation in Tokyo,

Professor Kitasato went to Germany, where he became a pupil of Professor Koch, and gave seven years and a half to work in his laboratory. Endowed with a gifted mind, and an untiring worker, he soon gave evidence of his scientific attainments, accomplishing discoveries in bacteriology which had escaped the efforts of his learned master—notably, the discovery and elaboration of a method by which he obtained a pure culture of the tetanus bacillus. Soon after his return to Tokyo, on the completion of his studies in Germany, he visited Hong Kong, China, where, at the time, the plague prevailed. His study of the disease enabled him to make a great contribution to medical science in the discovery of the Bacillus pestis, or plague microbe. The Hygienic Institute is a Government school of instruction, and is supported by an Imperial appropriation. A small tuition fee is received from the students, some eighty in number, who are graduates in medicine and physicians engaged in practice throughout Japan. The course of instruction extends over a period of four months, and is devoted entirely to laboratory and research work. It is essentially a school of preventive medicine. Associated with the work of the Institute, and under the direct control of Professor Kitasato, is a laboratory for the preparation of serums and antitoxins for infectious diseases, including a long list; a station for the manufacture of vaccine lymph; a hospital for the treatment of patients suffering from acute infectious diseases, and a farm on which there is a colony of lepers. A large number of animals of various kinds are kept to assist in the preparation of the serums and in the research work of the laboratories, among them 200 horses and a number of heifers, dogs, monkeys, rabbits, guinea-pigs, etc. I witnessed the operation of venesection, performed upon a horse which had been infected with the plague bacillus, the blood being used for the purpose of making the prophylactic serum. The leper colony is established on a farm a few miles distant in the country, and contains about fifty patients, men and women, suffering from the two forms of leprosy—the anesthetic and tubercular—in various stages of development. Professor Kitasato hopes, by the opportunity thus afforded him in the collection of patients, to study the disease and discover a remedy for its cure.

In the Orient, Japan takes the first place in all that relates to the adoption and cultivation of modern scientific methods in medicine. That this is so, and that it has been done, is, I think, easily understood, when the character of the people and their conditions of life, which have existed for ages, under the feudal system, are taken into consideration. From under this system the continent of Europe emerged and gradually acquired the conditions of life, social, intellectual, and political, which founded and have given character to Western civilization. It is not so with China, with the many ages of her civilization and modes of government, nor with India under her former or present mode of government. Of all the countries of the Orient, Japan has the most perfect and extended system of education—from the kindergarten, through the grammar and high school, to the college and university. Education is compulsory, and the school and college training is such as to fit her citizens for diversified callings and professions. In Japan, religion does not exert the all-absorbing control as in China, and especially in India.

On completing my sojourn in Japan I journeyed to China, stopping *en route* at Kyoto, Kobe, and Nagasaki, in Japan. Hong Kong, China, was my destination, and there, through the courtesy of friends in providing me with letters of introduction, I was enabled to visit the hospitals and obtain some knowledge of medical matters. It was not a very fertile field for observation, as the city is a British concession, and is given over almost entirely to the purposes of trade. Hospitals and health offices are in the hands of English physicians, and are conducted in the same manner as in the mother country. I soon learned there, as in other cities of China I visited, that outside of the few hospitals, and fewer medical colleges connected with them, under British or American control, modern medical science did not have a very firm foothold in China. In the Empire, to a large extent, it did not exist. For some years there has been associated with the work of the missionaries medical care and treatment of the sick among the natives. In Canton I had the opportunity, as the guest of Dr. Mary Fulton, who has founded a medical college for the instruc-

tion of Chinese women and a hospital for women in connection with it, to learn what has been done in this direction. The

Hospital in Hong Kong, China, conducted by English physicians and surgeons.

college and hospital are conducted in harmony with the work of her brother, the Rev. Dr. Fulton, a missionary of twenty-five years'

Dr. Mary Fulton, the teacher, and the class of students in the Medical College founded by Dr. Fulton, Canton, China.

experience in this field. There is great need for educated foreign and native women physicians in China, and Dr. Mary Fulton is to be highly commended for the important work she has undertaken.

In the interior the conditions of life are such as to make the practice of medicine a very difficult and arduous task, attended in some instances by danger, as was made manifest in an experience related to me by Dr. Fulton. On this occasion she was in attendance upon a case in a miserable hut, the single room of which contained not only the human family, but all of the domestic animals. The pigs, for convenience and supposed safety, were placed upon an elevated platform occupying a corner of the apartment. At midnight, during her lonely watch by the bedside, a large tiger, gaining admission through the entrance, leaped upon the platform, seized an unwilling pig, and escaped with it into the jungle.

Chinese girls are in constant danger of kidnapping for the purpose of subjection to immoral lives, to prevent which they are carefully guarded in their homes and in the schools which they may attend. These buildings are placed in a compound—as it is called—a place of varying size, surrounded by a high wall, and the entrances are protected by strong gates, with a watchman to guard them. Married women are not exposed to the danger of kidnapping, and in some cases the girls contract marriage at an early age, so that they may obtain their education unmolested.

Mrs. Butler's school for girls, in which there are some two hundred, is an institution which is doing excellent work in the education of Chinese girls, some of whom take up work in the missionary fields when they have acquired a medical education. I found also much interest in a visit to the Canton Hospital, which was opened, I think, in 1835 by Dr. Kerr, a missionary. This hospital has had a place in the records of surgery for many years, by reason of the large number of cases of vesical calculi operated upon by Dr. Kerr. The collection of calculi in the museum contains hundreds of specimens, and they present many points of interest in character and size.

On the day of my visit I witnessed two operations by Dr. Todd, in charge of the hospital, and Dr. Peck, U. S. Navy, in which calculi of large size were removed by the lateral method. Chloroform was the anesthetic agent used, and I was told that it was given freely to Chinese patients without danger. Also, that recovery

from operation was the rule, Chinese patients not being very susceptible to shock from operations or septic conditions. In the wards I saw patients lying on boards without mattresses, with simply a blanket for covering, which formed part of the ancient wooden bedsteads, with openings to permit the urine to pass to a receptacle on the floor. On all sides there were evidences of the lack of the employment of modern methods in hospital conduct, owing probably to the want of sufficient means.

In the hospital I had the opportunity of examining the small feet of a woman upon whom abdominal section had been performed. The small feet are produced by the process of "binding" the feet with tight bandages, and in this way preventing their growth. It is a cruel operation, and is now forbidden by edict. It was done by the rich families, who regarded it as a mark of distinction, indicating their position in the social world. In the examination I made I found it very difficult to trace the outline of the bones of the tarsal and metatarsal regions, while the phalanges appeared to have undergone such atrophic changes as to make them quite indistinguishable.

I was glad to learn of the recent establishment of an insane hospital in Canton, accomplished largely through the efforts of the missionaries. Heretofore, I was informed, those suffering with insanity were put to death. The organization of a hospital for their care and treatment is a gratifying evidence of progress and of the proper appreciation of scientific medicine.

In Canton sanitary regulations are not enforced, and the foul air and filthy streets are a constant menace to the public health. The smells are rank, and make a lasting impression upon travellers who visit the city.

In marked contrast to the conditions which exist in Canton, the traveller sees much in Shanghai which gives evidence of the influence of Western civilization, in the palatial modern buildings, hotels, clubs, hospitals, and many charitable institutions. It must be said, however, that the Chinese part of the city, containing within the ancient walls over 1,000,000 inhabitants, still preserves the characteristic features and conditions of a Chinese community,

undisturbed to any great extent by its juxtaposition to the foreign part of the city, which is occupied by representatives from every part of the civilized world, official, commercial, and religious, numbering some 6000 people. There are four hospitals. The Shanghai General Hospital is the largest, and has a capacity of 130 beds. It is conducted exclusively for the treatment of foreigners, and is in charge of the Sisters of Charity of the Order of Saint Vincent de Paul. It was opened in 1867, and contains private rooms and wards which may be occupied by patients who can pay a small charge and receive medical treatment free. In the private rooms the charge is one "tael" (one Mexican dollar) per day. A generous patronage makes the hospital self-supporting, and gives each year a very satisfactory surplus. The remaining three hospitals are Chinese, two being in the charge of missionaries. One was established forty years ago, and has on its staff foreign and Chinese physicians and surgeons. In this hospital Dr. N. MacLeod, a graduate of the University of Edinburgh, one of the most prominent foreign physicians in Shanghai, introduced, in 1877, aseptic methods in surgery. Through the efforts of Dr. MacLeod and the foreign physicians much has been done to develop scientific medicine and promote the conservation of the public health in Shanghai, the influence of which is felt in some direction in the middle and northern parts of the Empire. A municipal health officer was appointed thirty years ago. Over five years ago a bacteriologist was chosen and the manufacture of calf lymph begun. Vaccine lymph is sent from this station to the interior of China, and is distributed to foreigners and natives. The establishment of a Pasteur prophylactic laboratory for the treatment of cases of hydrophobia gives gratifying evidence of progress. For a number of years a lock hospital has been in operation, where Chinese prostitutes undergo weekly examination and treatment. Within a few years this has been incorporated with an isolation hospital for the Chinese. An insane and isolation hospital have been built for the treatment exclusively of foreigners. Laundries, dairies, and cattle, meat, fish, and game shops are under municipal supervision. The slaughter

of cattle, except in the public "abattoir," is forbidden. All night soil is removed daily, and used for fertilizing purposes. Some of it, Dr. MacLeod thinks, through the agency of myriads of flies which exist, returns to the kitchen and taints the food, producing a large proportion of the alimentary canal disorders and, possibly, some of the cases of enteric fevers. Among the epidemic diseases, beri-beri and cholera occur quite regularly in the late summer and autumn. Among the Chinese it is thought tuberculosis does not prevail to the same extent as in the white races in other parts of the world. With the exception of acupuncture, which has been very generally practised among the Chinese for ages, the native physician does not undertake surgical operations. As a result, the hospitals, in the charge of foreign medical men, receive a large number of surgical cases. To the Canton hospital stone cases come from very distant parts of the Empire, the hospital having for many years enjoyed a reputation for the successful treatment of these cases. The same may be said with regard to tumors involving various organs and parts of the body, some of them attaining great size. In considering the state of modern medicine in China, it is necessary to bear in mind that it has reached its highest development in those cities in which there is a large foreign population, comparatively speaking, which demands its practice, among other conditions of Western civilization. In order that it shall permeate the interior of the Empire and have a recognized position throughout the country, it is necessary that the system of education shall be changed so as to be in harmony with that in Europe and America, or even that of Japan. Already an educational movement has been started in this direction, which will eventually accomplish the desired result. Throughout the Orient education has been the great lever with which countries have been raised to the appreciation of their great but dormant power. Japan has come to its full realization. China is awakening, and India, restless under foreign dominion, is cherishing, through its educational system, aspirations of nationalization.

On my way from China to India I stopped at Colombo, the seaport of Ceylon, an island colony of Great Britian. A small

medical college has been established here with a general civil hospital, a bacteriological institute, lying-in hospital, and a colony for lepers. The instruction in the college and hospital is given by English physicians and surgeons; women students are admitted. In the hospital the nursing is done by Anglican Sisters, assisted by nurses trained in the hospital. Another general civil hospital is at Kandy, a town of 20,000 inhabitants situated in the mountainous regions of the island, 1800 feet above the sea level and fifty miles from Colombo. The railway, *en route*, passes through the tea plantations of Sir Thomas Lipton, the well-known tea-grower and yachtsman, whose unsuccessful and persistent efforts to return the Queen's Cup to its original home has given him an international notoriety, and very largely, no doubt, increased the sale of Ceylon tea. The hospital is built on the pavilion system, with roofed connecting walks, cheerful, airy wards, and is well conducted by a staff of excellent physicians and surgeons, assisted by Anglican Sisters. It has a very interesting record in the treatment of cases of tetanus, some twenty cases reported without a death. Of these cases, a number were puerperal in character. The Government Botanical Garden, five miles from Kandy, is full of interest to the physician. It is an experiment station, and has in it a complete collection of tropical trees and plants. In the collection of trees are specimens of the different varieties of the cinchona. It was an agreeable pastime to an inhabitant of the temperate zone to wander through groves of cinnamon, nutmeg, and spice trees, the air laden with fragrant odors of mixed variety. Farther up the mountain, at an altitude of 7000 feet, there is another Government Botanical Garden, the purpose of which is the cultivation of trees and plants indigenous to a temperate climate. These gardens are educational institutions, and receive liberal support from the British Government, which takes much interest in their successful conduct. In the Kandy garden it was interesting to see the monster bats—quite as large as the crow—hanging from the dead limbs of the trees in great numbers—apparently thousands of them. Disturbed by the noise of our carriage, they left their

points of suspension and circulated about us, filling the air with a peculiar sound and emitting a very disagreeable effluvium.

Colombo is an important seaport, the stopping place for sea-going vessels going to and coming from the East, Africa, and Australia. It has never been infected by the plague, owing to the precautions taken and the vigilance practised by the plague committee, composed of municipal and medical officers. The spread of leprosy throughout the island is prevented by the strict enforcement of laws which compel segregation in the colony provided for all sufferers from the disease. Ceylon presents to the world a bright example of what modern medical science can do in conserving the health of the people, and in this way protecting its commercial interests, so as to make it the richest colony of Great Britain.

From Colombo I sailed to Bombay, a city of India sharing with Calcutta distinction as a great commercial metropolis as well as a medical centre. It has a population of nearly 800,000, somewhat less than that of the capitol, Calcutta, and it is the seat of the Grant Medical College, the largest one of the four medical colleges of the country. Connected with the colleges are hospitals which are used in conducting clinical and laboratory instruction. Besides these hospitals there are many located in the cities and towns throughout the country. The teachers in the colleges and attending physicians and surgeons in the hospitals are taken from the corps of medical officers in the Indian Military Service, which consists, at the present time, of 175,000 English and 250,000 native troops. Since the mutiny in 1857 the proportion of English to native troops has been increased, and the native troops are now enrolled from the lowest Hindu castes, which are not inspired with the spirit of nationalization as are those of the higher castes, and are, therefore, more subservient to discipline. The teachers in the colleges and medical officers of the hospital receive fairly liberal compensation for their work, and on retirement are placed on the pension list. In case of death, the widow and children receive pensions, the boys up to the period of manhood, and the girls until marriage. The students in medicine—male and

female—consist of Hindus, Parsees, and Eurasians, or half-breeds. Very few Mohammedans enter the medical profession. The male graduates in medicine enter the military medical service among the native troops, obtain hospital positions and medical office in the municipal governments, engage in private practice, or serve as district physicians in the civil service, which in its work covers the entire country. In Upper India I met on the train a civil service medical officer, who informed me he was returning from a visit through his district, which had a population of 3,000,000 people. He, with a large corps of native physicians, had the medical care of this large number of inhabitants, a colossal undertaking in the presence of epidemics of contagious or infectious diseases. The female graduates in medicine take up hospital work, or engage in private practice, in which the success is not very great. Training schools for nurses are connected with the various hospitals; in these the instruction and training are not quite as efficient as in those of Japan. The medical colleges are in affiliation with the universities, which constitute the head of the educational system carried on by the British government. They are organized and conducted upon the same plan as the medical schools of Great Britian, the mother country. The requirements for admission and graduation and the courses of instruction, including dentistry, are the same as in those schools. Students who desire to enter the military service after graduation must be of European or Eurasian parentage.

From this statement of the character of the medical institutions concerned in teaching scientific medicine in India, it will be interesting to note to what extent modern methods are employed in dealing with the great question of the prevention of disease and the successful control of it when present. There are many endemic and epidemic diseases occurring yearly at different seasons, which, owing to the religious beliefs and superstitions of the natives, as well as to their modes of life, make the work of the medical men most difficult, in some instances absolutely nullify their efforts. The Government, with all of its power, refrains, except in extreme conditions, from the enactment and the

execution of sanitary laws and regulations, and hesitates to interfere with religious rites and customs which may be harmful to the well-being and welfare of the community, lest the quickened sensibilities of the natives should be aroused and increase the difficulties of peaceful control. The Hindu, whose religion forbids him to kill an animal, permits the plague rat, which carries in its hairy covering the plague flea, to eat from the receptacle containing his food, and to share with him, without restraint, the filthy hut he inhabits. The municipal authorities trap the rat on his place for the purpose of submitting it to examination and using it in experimen-

Towers of Silence, Bombay, India.

tation, and the Hindu makes it free. The Government has, indeed, been successful in interdicting "Sutteeism," the self-immolation of the widow upon the funeral pile of the deceased husband, but it has not been able to prevent absolutely infanticide, caused by exposure of the female infant upon the banks of the sacred rivers, to become the prey of the rapacious crocodile. It required, I was informed, much tact on the part of the municipal authorities to prohibit the subject of smallpox, with fully developed eruption, from parading the public streets of Bombay or taking part in public meetings of the natives, and so it may be stated with regard to

other conditions of life which are hostile to the welfare of the community, as, for instance, the public cremation of the body of the Hindu in the open air, dead from contagious or infectious diseases of most dangerous character, or the exposure of the dead bodies of the Parsees in the towers of silence, where the soft parts are devoured by vultures. The towers of silence are on Malabar Hill, one of the most fashionable parts of Bombay and the residence largely of the opulent citizens. A large reservoir which supplies this portion of the city with water is but a short distance from the towers, and until three years ago it was uncovered. It is related that it was not an unusual sight to see pieces of the dead bodies, carried away by the vultures, dropped by them into the water of the reservoir, and also, that unfinished morsels of fingers and toes were brought into the houses of the fashionable residents of Malabar Hill by their pet dogs and cats, who gathered them on the well-kept lawns, on which they had been deposited by the vultures as they rested in the trees. Notwithstanding these unfavorable conditions and almost insurmountable difficulties which obstruct the adoption of progressive methods, the medical officers of the Indian medical service, with commendable zeal, continue their efforts to educate public opinion, and to inspire the natives with an appreciation of their labors in their behalf.

The plague appeared in India in 1896, since which time it has killed over 1,000,000 of the inhabitants, including in the list a few Europeans and not many Parsees. When it was ascertained that the plague rat was the cause of the disease, a war of extermination was commenced in different parts of the country, and by the orders of the Government a bounty was paid for the rats killed. It is interesting to note that, after a time, it was found that the natives had formed rat-raising corporations, which carried on a lucrative business, the adoption of a bit of Western civilization quite novel and unexpected. The Government, moved by an appreciation of its duty, called into existence the Research Commission, of which Mr. W. M. Haffkine, a scientist from Russia, was made the head. This gentleman has made valuable contributions to medicine in the discovery of a cholera serum and a plague serum, each possessing

prophylactic powers. The Commission was installed at Parel, a suburb of Bombay, in a large building located in spacious grounds, which had been the residence of a former Governor-General. At the time of my visit Lieutenant-Colonel Bannerman, Major Lamb, and Captain Liston constituted the Commission, and to these officers I carried a letter of introduction from Mr. Millard, Honorable Secretary of the Natural History Society of Bombay, which gave me the opportunity of observing the work done in the Research Laboratory. To these gentlemen I am indebted for many courtesies.

The Commission, acting in coöperation with the Board of Health of the city, receives each day a large number of rats, which are trapped in the different districts of the city, especially in those infected with the plague. Each trap is covered with a strong cloth covering and then tagged, stating the kind of rat—rattus or rattus decumanus—and where trapped. These are then transported to the laboratory and submitted to examination. On the day of my visit four ox carts laden with filled rat traps arrived, and I was informed that on some days at least one thousand were examined. The first step in the process of examination consisted in placing the live rats—some are found dead from the plague, and these are brought with the live rats to the laboratory—into an hermetically sealed receptacle and subjecting them to the vapor of chloroform. This agent kills the rat and simply stupefies the fleas. When dead, the rats are placed on a table covered by white paper, at which stands an examiner, a European, and his assistant, a native. These strip the rat with the hand, and by this movement dislodge the stupefied fleas, which, falling upon the white paper, are picked up by the moistened finger end and placed in a test-tube closed with a sterilized stopper. Shortly the fleas revive and are put away for use in demonstrations. From this table the rat is carried to the next, where the autopsy is made and the organs infected are removed. Usually the inguinal and axillary, seldom the cervical lymphatic glands, in some instances the lungs and the liver, are found involved. These organs are placed in a preservative fluid and kept for further examination and experimental purposes.

The fleas are used in two ways in experimentation. In the first, a guinea-pig is placed in the inner compartment of a box shaped like a large cheese-box, which is enclosed by wire netting having a large or small mesh, and the live fleas are deposited in the outer compartment on the floor, which has been covered with plain paper. If the meshes in the wire netting are large enough to permit the fleas to enter the inner compartment in which the guinea-pig is placed, it is found that the animal is infected with the plague bacillus, and after a period of incubation of nine days the disease manifests itself. If the meshes of the wire surrounding the inner compartment are too small to permit the ingress of the fleas, the animal is not infected. If, instead of the ordinary paper, "tangle-foot paper" is used to cover a portion of the floor of the outer compartment, leaving a free border on which the fleas are placed, it is found that the animal escapes infection, the fleas being unable to cross over the tangle-foot paper. The fluid obtained by crushing a number of fleas conveys infection if injected hypodermically into a non-infected rat or guinea-pig; the same condition occurs from the fluid obtained by crushing the infected organs taken from a plague rat. These experiments prove conclusively that there is, first, a plague rat stated to be indigenous to the Orient, of two or more varieties—rattus and rattus decumanus. Second, that the flea on the plague rat becomes infected, and acts as the medium of conveyance to other animals which are susceptible, and to the human subject. It is believed that the flea does not become the host in the same sense as in the case of the mosquito in malarial and yellow fever infections. The flea, it is stated, at the time of biting passes a fluid from the intestine which contains the bacillus, and which is rubbed into the wound made, either by the hand of the person bitten or by the clothing.

In my interview with Prof. Kitasato, at Tokyo, I understood that he did not accept, unreservedly, this method of infection in the human subject. He thought the bacillus could enter the body by inhalation or through abrasions on the feet or other parts of the body, the bacilli having been set free from rats dead from the plague, and which had undergone decomposition. Further

investigation of this subject, it is hoped, will determine positively the question as to the mode of conveyance of the microbes from the flea to the human subject. It would appear reasonable that the flea should act as the host, as in the case of the mosquito in yellow fever infection.

Calvert (Osler's *System of Medicine*) states that the origin of the plague among rats has not been determined; it may arise from infected material recently introduced into a district or propagated by cases among them. Rats with open ulcers from broken-down buboes are important factors in keeping the disease alive. Flies and fleas contract fatal plague, the former may infect food, the latter transfer bacilli from place to place, and their bite produce direct infection. Bacilli may remain virulent in the stomach of bedbugs for a number of days; their bite is harmless; if mashed on the wound, infection may take place. Ants harbor bacilli for a number of days or may carry infection from place to place, especially from cadavers to the surface of the ground. Buboes occur most frequently in the groin, next in the axilla. Infection, in a majority of cases occurs through skin of the trunk or extremities, and may enter any abrasion or even microscopic wound of skin or mucous membrane. In children infection occurs most often through abrasion of the buccal mucous membrane. Bacilli introduced into the stomach may or may not produce infection. In all well-advanced cases all of the secretions and excretions may contain bacilli. Pus from buboes, excretions from pustules, vomitus, sputum in pneumonic cases, bedding, furniture, and room may become infected. Those in attendance are exposed to infection through abrasions. Very few hospital attendants have contracted the disease. Cadavers contain many bacilli, and are dangerous sources of infection until disinfected or destroyed by cremation. One bacillus may produce infection. The viability of bacilli is long; intense cold does not kill the organism. To ordinary disinfectants bacilli are very susceptible. Contagion is conveyed by convalescent patients with old unhealed ulcers from buboes, and individuals who have been exposed to infection but have not developed the disease may convey it. On board of ship, clothing,

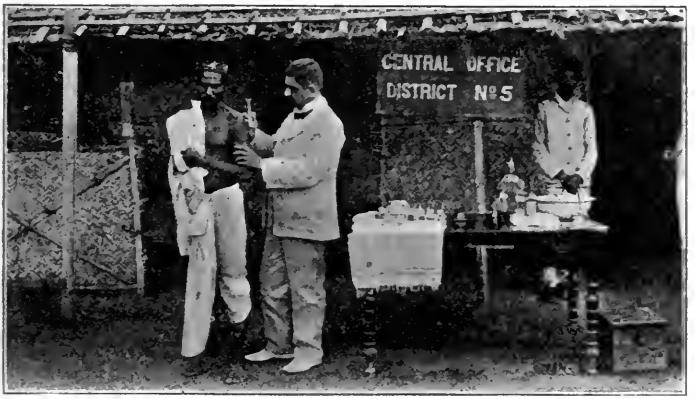
merchandise, fabrics, and raw materials are most important means of conveying the disease. Water and air are not good carriers of infection. Insects, in limited areas, may be sources of infection. Plague thrives best among those who live in filth. From twenty to forty years of age the majority of cases occur. This is believed to be on account of the exposure which occurs at that time of life.

Since my return from the Orient I have had an opportunity to examine the *Public Health Reports* issued each week by the Public Health and Marine Hospital Service of the United States, and have been greatly interested in learning of the extensive work done by this service in connection with the prevalence of the plague at San Francisco and in cities adjacent, Oakland, Point Richmond, and Emeryville, California. The causes of the disease have been attacked with the most modern measures and with an energy which gives promise of complete obliteration, although experience thus far gained seems to indicate that when it once gains a foothold it is not possible to permanently eradicate it. Rat destruction, by trapping and cremation and by the deposit of poisons, has been carried on extensively, those destroyed numbering thousands, and an abatement in the spread of the disease has been noted. I have learned from the Surgeon-General of the Public Health and Marine Hospital Service that a small quantity of plague serum was used during the early part of the present outbreak in San Francisco, and further, that the Bureau is informed that plague serum has never been successfully produced in the United States, owing to technical difficulties and dangers inseparable from its manufacture. Of these difficulties I was not informed in Bombay, and I was led to believe that the serum was prepared there.

In Bombay I was informed that but two varieties of plague rats had been identified, mus rattus and mus decumanus. In the reports from San Francisco it is stated that in addition to these there have been identified the mus alexandrus and mus musculus. Many thousands of rats have been examined bacteriologically, and some have been, in experimental research work, infected with the Bacillus pestis. A large number of premises have been inspected, many disinfected, and some destroyed. The Government is to be

commended for the vigorous way in which the disease has been attacked, through the excellent work of the Public Health and Marine Hospital Service, and the promise of, at least, keeping its dissemination in abeyance is very encouraging. Eternal vigilance will alone keep it from assuming an epidemic form, and that must be practised.

At the time of my visit to Bombay the plague was prevalent in the city and Bombay presidency, the reported deaths numbering weekly some twenty-four hundred. The plague hospital received as many as twenty to thirty cases each day, including the pneu-



Prophylactic serum inoculation against plague, Bombay, India.

monic and bubonic varieties. The former is very fatal—the lungs are affected and patients die in three or four days after development of the disease. In the bubonic form the inguinal glands are inflamed and pass on to the stage of suppuration; the disease progresses more slowly than in the pneumonic variety. A general septic condition is present in all cases; if recovery takes place, the convalescence is slow and sometimes retarded by complications. The treatment is expectant, stimulating, and supporting. Suppuration of the affected glands is hastened by poulticing, and aseptic incision is practised when fluctuation is present. Excision of the affected glands has been performed, with the hope of aborting the infection, but without marked success. The prophylactic treat-

ment by serum inoculation is carried out by Government authority among the natives whenever it is possible. Many resident foreigners submit to the operation. Inoculation is gaining favor, and it is believed that in not many years opposition to its practice by the native population will be generally overcome and it will take its place by the side of vaccination as a well-established preventive measure. The plague serum is prepared at the Parel laboratory and is sent to the different parts of the country. The period of immunity obtained by one inoculation is thought to be not more than two or three years. Experience gained in its use may extend this period.

As in other parts of the Orient, there is at Matunga, a suburb of Bombay, a home for lepers, where some four hundred men, women, and children are cared for. Residence here is not compulsory, but the unfortunate sufferers from leprosy find in the hospital so much comfort and relief from suffering that they gladly remain; moreover, the grounds in which the buildings are placed are made most attractive by plants and flowers and efforts at landscape gardening. I made a visit to this institution in company with the native physician in charge, Dr. Chudder, and was much impressed by what I saw and learned. Patients exhibiting the two forms of the disease, anesthetic and tubercular, were examined in the wards, which were scrupulously clean, well-lighted, and well ventilated. In a few, operative measures by amputation had been tried to stop the progress of the disease in the extremities; these appeared to be successful. Much is done to make the life of the inmates contented; a Hindu temple, a Mohammedan mosque, and a Roman Catholic chapel, built in the grounds, afforded them opportunities to worship according to their creeds. There was no protestant chapel. Missionary protestant ministers from the city, I was informed, came when their services were needed. A schoolhouse provided a place for the instruction of the children, who all seemed to be happy and satisfied with their home. That which interested me greatly was the method employed in the sewage disposal, the resultant obtained being gas, which supplied all the fuel needed in heating and cooking and illumination of the grounds

and buildings. A small cremation furnace had been built, which Dr. Chudder hoped would be used by the Hindus in burning their dead. It was, he said, educational in character, and thus far he had succeeded in having one body thus cremated. The substitution of the closed crematory for the funeral pile of wood in the open he regarded as very essential for many reasons.

In Bombay over a hundred lepers wander about the streets and gain a scanty living by begging. In Calcutta the municipal ordinances are very strict with regard to what kind of work lepers may engage in. One ordinance, according to the report which has been made to our Government by the Consul-General at Calcutta, directs that no leper shall, within certain areas, from which lepers may be sent to asylums, personally prepare for sale or sell any article of food, drink, drugs, or clothing intended for human use; bathe, wash clothes, or take water from any public well or tank debarred by any municipal or local by-law from use by lepers; drive, conduct, or ride in any public carriage; or exercise the calling or trade of barber, washerman, water-carrier, baker, confectioner, tailor, draper, haberdasher, domestic servant, schoolmaster, clerk, medical practitioner, or butcher.

In view of these stringent municipal regulations, it would appear that the disease is regarded as hostile, in most marked manner, to the public health and conveyable by personal contact and through food and drink.

Each year in India many lives are destroyed by snake bites, the country being the home of the most venomous specimens of cobras and vipers. I have the report of one year in which 24,000 people were killed, and a large number of domestic animals. The great mortality from this cause has moved the Government to take measures of prevention, and to this end has established a laboratory, under the care of Major Lamb, for the preparation of antivenene, to be used as a curative remedy. This is made from the venom obtained from the venom sacs of the cobras and vipers, and is distributed throughout the country in a dried state, in small phials. Major Lamb, who has had large experience in this work, does not believe that there can be made an antivenene which is a

general specific. The antivenene curative in cases of poisoning by cobra bites must be made from the venom of the cobra, and so in the case of all venomous snakes. This opinion is at variance with that entertained by Calmette, of France, the discoverer of antivenene, who believed in a general specific antitoxin. I saw a number of cobras and vipers in the collection Major Lamb had with him at the Parel Research Laboratory, and was interested in the way they were handled in order to obtain the venom for the manufacture of antivenene. In my early professional life I assisted, at times, Dr. Weir Mitchell in his work in connection with the rattlesnake venom, which was of great value as a scientific contribution. My duty was to hold the snake, an humble, but a very important one. In his own case, Major Lamb exhibits the value of the antivenene as a curative remedy, he having been bitten by a cobra whilst obtaining venom. Owing to delay in getting the remedy, he became profoundly affected by the poison before the injection could be made. The loss of the distal portion of the index finger testifies to the local effect of the fang laceration.

Our country, by reason of the acquisition of Oriental possessions, has become one of the great powers of the world, charged with important responsibilities in the care of Oriental races. Already in the Phillipines have we seen the important part taken by our profession in making that country safe for the residence of military and civil officials reared in the climates and accustomed to the conditions of life belonging here, as well as promoting the conditions of life of the native inhabitants. By reason of our close contact, social and commercial, with Oriental countries, their diseases, with their products, have come to us. The plague has, I fear, a foothold upon our Pacific coast, and leprosy exists, happily to slight extent as yet, in many parts of our country. The progress of the sleeping sickness in Oriental countries gives us warning. I need not tell what is the duty of modern medical science in dealing, through its disciples, with these conditions. In our country today—in the home, in the village, in the town, in the city, and in the state—the medical profession, equipped with knowledge as never before, and armed with the lessons of experience gained in

wide fields, submerged sometimes, it may be, with disaster, or crowned with success, stands on guard, the valiant protector of the health of the people. In reverential memory we will ever cherish the name and the exalted labors of that heroic son of medicine, Dr. Lazear, of the Medical Service of the United States Army, who, in Cuba, gave his life that his fellow men might live, and we point with feelings of pride, which stir to the profoundest depths our patriotic emotions, to the transcendent achievements of Col. Gorgas, Medical Officer of the United States Army, which have made possible the construction of the Panama Canal. May we not justly claim this colossal enterprise, surcharged, as it will be when completed, with the destinies of the people of the world, as a magnificent triumph and the crowning pride and glory of American medicine?

FURTHER EVIDENCE IN SUPPORT OF THE THEORY THAT HODGKIN'S DISEASE IS A TYPE OF SARCOMA.

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Two years ago, in a paper read before the Southern Surgical and Gynecological Society, I reported a series of cases of Hodgkin's disease, observed in connection with upward of 70 cases of sarcoma originating in the lymphatic glands. This small group of tumors, designated as Hodgkin's disease, or pseudoleukemia, have certain definite clinical and histological characteristics sufficient to differentiate them from other tumors of the lymphatic glands, *e. g.*, tuberculosis and the ordinary types of sarcoma. However, a closer study, clinical, microscopic, and anatomical, furnishes strong evidence that the process we are dealing with is a neoplastic one, so similar to sarcoma as to be properly classified as a variety or type of the latter.

I have, up to the present time, observed upward of eighty cases of sarcoma of the lymphatic glands. Many of these cases so closely simulated Hodgkin's disease that it was difficult to distinguish the two conditions. In some cases the clinical appearance was like that of an ordinary sarcoma, several examples of which were cited in detail in my former paper (*New York Med. Jour.*, March 30, 1907), yet the microscopic examination showed a picture which the pathologists who had made a most careful study of Hodgkin's disease pronounced absolutely typical of pseudoleukemia.

Again, I have observed a tumor starting in the supraclavicular region, involving both cervical and axillary regions, as also both

groins, later invading practically all of the mesenteric and retroperitoneal glands; in other words, forming a typical clinical picture of Hodgkin's disease; and yet the same pathologists pronounce the tumors round-celled sarcoma.

The pathological and clinical pictures of Hodgkin's disease have already been fully presented by Dorothy Reed, Longcope, and others.

The main points of pathological significance are described as enlargement of lymph glands, absence of infiltration of the capsule, grayish surface, broken by intersecting yellowish lines; metastases in the viscera presenting a similar appearance, though of irregular outline and apparently invading the organ in different directions. On section they present the same appearance as described in the glands. On microscopic examination there is found dilatation of the bloodvessels and lymph sinuses, marked increase in lymphocytes and proliferating endothelial cells, numerous giant cells with one or more nuclei, and prominent nucleoli appear in a great number; occasionally a very large giant cell with many small nuclei peripherally arranged is seen. An increased number of eosinophiles is generally observed. Reed states that the capsules of the glands usually show no change except possibly some thickening. This, however, is not borne out by other writers, especially by Gibbons in his recent work.[4] Careful autopsy studies were made in 5 of his cases, while in Johns Hopkins Hospital the material was limited to three autopsies only.

The large giant cells are the most striking feature of the sections from Hodgkin's disease tumors. Reed states that they occur in great numbers in the large lymph sinuses of the glands, and occasionally are seen in the bloodvessels. They vary remarkably in size, from two to three times the size of a red blood corpuscle to twenty times its size. Sometimes as many as eight to ten nuclei are seen in a single cell. Large numbers of eosinophiles were observed in all but two of Reed's cases.

The clinical picture of Hodgkin's disease is as follows: It almost always begins in the glands of the neck, may occur at almost any period of life, but is more commonly seen at an early age, and is

more frequent in the male than in the female sex. A tuberculous family history is rarely found. The glands begin to enlarge on one side first; very quickly enlargement is noticed on the other side also; a little later the axillary glands are affected, and finally the inguinal glands also. These enlarged glands differ clinically from both ordinary sarcoma of the lymphatic glands and tuberculous adenitis. On palpation they show much greater mobility than is seen in ordinary sarcoma or tuberculous glands, giving the sense of a discrete, independent nodule. The skin is not affected; the glands move freely upon the deeper parts. There is entire absence of the "fusing together" in these independent masses, so commonly found in tuberculous adenitis. Neither is there any tendency to breaking down or caseation. Later on anemia develops without any particular increase in leukocytes. The spleen is often markedly enlarged, and, in the later stages, also the liver, and marked cachexia appears. In some cases the spleen extends nearly down to the brim of the pelvis.

Miki Yamasaki, after a rather extensive review of the literature of the subject, believes that the consensus of opinion is in favor of regarding Hodgkin's disease a clinical and anatomical entity rather than of tuberculous origin.

Yamasaki believes, however, that under certain conditions Hodgkin's disease may change into sarcoma. He bases his belief on two cases observed at Prof. Chiari's Institute in Prague, which he reports in full. In both cases, one originating in the thymus, the other in the lymphatic glands of the neck, the neoplasm had invaded the neighboring organs and produced numerous secondary tumors, a fact which decidedly differentiates these cases from the other cases of Hodgkin's disease reported; yet the histological picture was strikingly like that of Hodgkin's disease.

Reed's careful and most thorough work has, in the minds of most investigators, entirely disproved the theory of the tuberculous origin of Hodgkin's disease; yet there are a small number who still cling to the tuberculous theory, or at least believe that it cannot be entirely set aside.

One of the most recent papers dealing with this question is that

of La Roy, of Gand.[9] La Roy has made a very careful histological study of seven cases. His conclusions based upon this study are, that under the names of pseudoleukemia and Hodgkin's disease two distinct diseases are confounded. Pseudoleukemia and Hodgkin's disease differ from lymphatic leukemia only in the blood picture of the two diseases. On the other hand, there is a chronic affection of multiple glands, probably of tuberculous origin, that more or less closely simulates true Hodgkin's disease and lymphatic leukemia. These two groups of tumors, in the opinion of La Roy, differ in several material points. In the tuberculous variety leukocytosis is more apt to be present, while in Hodgkin's disease there is a lymphocytosis. Fever is much more likely to be present in the tuberculous variety than in Hodgkin's disease. Still further, there is a decided difference in the two groups in the manner in which they are influenced by the *x*-rays, the tuberculous type showing very slight changes under *x*-ray treatment, while the lymphatic and splenic enlargements seen in Hodgkin's disease often disappear or diminish strikingly under *x*-ray treatment. Still further, there is marked tendency to hemorrhages in Hodgkin's disease, which is very slight in the tuberculous type. La Roy holds that pseudoleukemia is practically identical with leukemia. This is the view already expressed by Banti, professor of pathology in Florence, Italy (*International Clinics*, 1906, iii, series 16).

Finally, and most recently, Stengel and Pancoast,[10] in their article on the treatment of leukemia, add further authority to this view. They conclude:

"Regarding the nature of the process it is impossible to dogmatize. Our own opinion, expressed in other places, has for a long time inclined us to believe that the disease is closely related to neoplastic processes. There is an undoubted close connection between certain sarcomata and leukemia. The histological features, the progress of the disease, the metastases, and the clinical analogies suggested by cases of undoubted sarcoma tend to confirm this opinion."

In both the lymphatic and myelogenous types Stengel believes that the trend of recent opinion is in the direction of proliferation of metastatic cells in the organs in which they have been deposited.

Those, on the other hand, who believe in the infectious theory regard the tumors of Hodgkin's disease and leukemia not as true metastases, but rather as local leukocytosis due to chemotoxic influence of some kind, or due to some unknown cause.

Neumann holds to the neoplastic nature of both leukemia and pseudoleukemia, and he states that if the pathological stimulus to proliferation falls first or alone upon the spleen and lymphatic glands, then we have, as a result, pseudoleukemia; while if this stimulus falls in like manner upon bone marrow, we have leukemia.

There is a strong tendency at present to regard leukemia of both types as primary in the bone marrow, and this opinion has been very strongly supported by Stengel and Pancoast.

Banti, Professor of Pathological Anatomy at the University of Florence, who has for many years made a very careful study of leukemia and pseudoleukemia, is firmly convinced that both are of a sarcomatous nature. The principal grounds upon which he bases his conclusions are that the enlargement of glands, spleen, etc., are not simply hyperplasia of normal lymphatic tissue:

1. Lymphadenoid tissue is often atypical.

2. Lymphadenoid tissue regularly invades the trabeculæ, frequently also the capsules of the lymphatic glands; even breaking through the borders of the glands and invading adjacent tissues.

3. The walls of the bloodvessels, especially the veins, are constantly invaded.

4. The frequent occurrence of hematogenous metastases.

5. The rarefaction of the bone due to erosion of the newformed tissue.

Banti, furthermore, states: "The name 'hyperplastic' should not be conferred on a tissue with atypical structure, which shows a tendency to invade neighboring tissues and gives rise to metastases. Such a tissue should be spoken of as neoplastic rather than hyperplastic."

In myelogenous leukemia the reasons for regarding the disease as sarcoma are even stronger. Here Banti states:

"1. The myeloid tissue, both primary and secondary foci, has always a more or less atypical structure as compared with normal bone marrow.

"2. The myeloid tissue invades the bloodvessel walls, particularly of the veins, and comes in direct contact with the blood by destroying the endothelium. The presence of blood channels without walls is characteristic of sarcoma.

"3. The myeloid cells produce hematogenous and lymphogenous metastases, just as do the cells of malignant neoplasms.

"4. The metastatic nodules, as in cancer, are produced by proliferation of important specific cells; the elements of the organs involved take no part in their formation.

"5. The osseous tissue may undergo eburnation or rarefaction, as in osteosarcoma.

"6. The periosteum and surrounding tissues may be involved by the extension of myeloid tissue from the bones."

Among the objections to the neoplastic origin of Hodgkin's disease and leukemia are, that they show so many features pointing toward an infectious origin, which, with the majority of pathologists, is sufficient to exclude them from the class of true neoplasms. Furthermore, it has been assumed that the tumors of Hodgkin's disease only invade preëxisting lymph gland tissue, and that they never infiltrate the capsule or overlying structures. While this is probably true in the majority of instances, there are certain important exceptions, as shown by the case reported by Gibbons in the *Journal of the American Medical Association* two years ago, and one of the cases which I shall relate in the present paper.

CASE I.—*Sarcoma of the Inguinal Glands, Simulating Hodgkin's Disease.* H. M., aged thirty-seven years, was admitted to the General Memorial Hospital on August 24, 1906. The patient was referred to me by Dr. A. G. Gerster as a case of inoperable sarcoma. Family history negative. The patient stated that he had always been in good health. Three years ago he first noticed a small swelling in the right groin. This grew slowly until it reached the size of a walnut; was never painful; general health remaining perfect. Five months prior to his admission the lumps in the groin began to increase in number and to grow rapidly in size. They finally interfered with his walking.

Physical examination at the time of his entrance to the hospital

showed heart and lungs normal. His right inguinal region is occupied by a number of independent tumors, more or less closely fused and extended deeply into the iliac fossa. The skin over the growths was freely movable. The right thigh and leg were considerably swollen. Inasmuch as the tumor mass seemed so unusually movable, it was deemed wise to attempt removal. This was done by my associate, Dr. Downes, on September 4, 1906. An incision, nine inches long, was made from the anterior superior spine, passing over the middle of Poupart's ligament and down along the course of the femoral vessels, and a very large number of nodules, varying in size from a marble to a lemon, all more or less completely surrounded by a capsule, were removed. The peritoneum was opened accidentally in one place and closed with catgut sutures. The wound healed satisfactorily, without suppuration. Microscopic examination of the growth, made by Dr. Clark, assistant pathologist of the hospital, and confirmed by Dr. Wood, of the College of Physicians and Surgeons Laboratory, pronounced it Hodgkin's disease. Portions of the tumor were also examined at Cornell Laboratory, and the same diagnosis was made. Blood examination on May 7 showed: Red cells, 4,200,000; white cells, 51,000; polymorphous, 35 per cent.; lymphocytes, 65 per cent.; hemoglobin, 80 per cent.

After the wound was healed the nucleoproteid serum from a case of Hodgkin's disease, prepared by Dr. S. P. Beebe from the Huntington Laboratory Fund for Cancer Research, was begun.* Nine tubes of 15 c.c. each were given without apparent effect. October 16 the serum was given up and the patient was put upon the mixed toxins of erysipelas and Bacillus prodigiosus.

There was some slight improvement under the toxin treatment, which, however, did not last. The blood examinations made during November and December showed the following:

* There is one case of Hodgkin's disease in which was used the nucleoproteid serum made by Dr. Beebe from portions of tumors removed, and in which case the tumor disappeared and the patient is well at present, more than a year later.

Red blood cells.	Hemoglobin.	White blood cells.	Polymorphous cells.	Lymphocytes.
4,000,000	75	34,800	64	34
3,800,000	75	38,000	55	45
3,600,000	70	56,000	60	40
3,400,000	65	56,000	65	35

The patient continued to fail markedly, and after leaving the General Memorial Hospital he entered the King's County Hospital, where he died about three months later. The autopsy records of the case, which have been kindly furnished me by Dr. Lawson, of the staff, add very greatly to the interest of the case. They strongly emphasize the striking similarity between Hodgkin's disease and sarcoma.

Autopsy Report. Body of a large stout man, moderately nourished: Skin shows a faint livid color; numerous flat nodules of about the size of a cent piece up to a quarter, chiefly on the abdomen and thighs. One of them in the right side of the abdomen has been excised. General anasarca of the lower parts of the body, especially marked in the skin of the thighs and legs, where part of the epidermis has been raised, forming vesicles which contain serous fluid.

Pericardial cavity contains about a tablespoonful of serous fluid. Heart corresponds in size to the fist of the body. Left ventricle slightly dilated; thickness of its wall about 1 cm.; of the right ventricle about 1 cm. Valvular apparatus shows no lesions. Through all yellowish patches and streaks within the intima of the ascending aorta.

Lungs. Right lung shows hypostasis of the inferior lobe, with foci of lobular infiltration and edema of the upper and middle lobe. The right pleural cavity contains about 300 c.c. of a yellowish, slightly turbid serous fluid, which contains fibroid coagula floating within the fluid, part adhering to the lusterless pleura pulmonalis. Left pleural cavity free, contains no fluid; left lung shows hypostasis in the inferior and edema of the upper lobes.

The peritracheal and peribronchial glands are enlarged about the size of a walnut; the cut surface is of a grayish white color, of

homogeneous appearance, lying between fine whitish streaks of fibroid texture; mediastinal space free.

The abdominal cavity contains no excess of fluid. Intestines apparently normal; after their removal an extensive tumor mass can be seen bulging on either side of the vertebral column, beginning about at the level of the last dorsal vertebra and descending on either side toward the groin. This mass of tumor involves the whole of the iliopsoas muscle on either side and becomes continuous with the periosteum of the vertebral bodies corresponding to the origin of that muscle, so that its separation from the vertebral bodies is very difficult, and could only be done artificially by the use of the knife.

A wedge cut out of the bodies of the second and third lumbar vertebræ shows on the cut surface that the periosteum, which can be traced otherwise, partially becomes lost in the tumor mass, which can be traced extending into the spongious substance of the vertebra in form of yellowish white streaks and patches.

The whole tumor mass extends in one process on either side toward the groin, following the course of the iliopsoas muscles, and enters the triangle of Scarpa beneath the groin, extensively involving the skin and tightly adherent to it. After its removal it shows about the size of a man's head. The cut surface shows that the iliac muscle, the fibers of which are distinctly separated, has been penetrated by a grayish white tissue, which appears between the bundles of muscle as nodules and grayish patches, and can be directly traced to the underlying retroperitoneal glands, the cut surface of which shows the same appearance, which has been described in mentioning the peritracheal glands. The size of these glands, which, closely packed together, form the interior of the tumor mass, varies from the size of a walnut to half an apple.

Spleen. Slightly enlarged, soft, capsule folded. Pulp shows dark red spots of small size, apparently hemorrhagic changes with lighter colored areas. Malpighian bodies not distinctly visible.

Left kidney, apparently normal in size, shows slight fetal lobulation; contains a moderate amount of blood. Capsule strips easily.

Cortex slightly narrowed. The differentiation of the parenchyma in the cortex and medullary substance is not distinctly marked; streaks of lighter colored tissue appear as well in the cortex as in the medulla, chiefly in the latter, and between the pyramidal columnæ. Kidney pelvis slightly dilated, as well as the beginning of the ureters.

Right kidney like the left, can only with difficulty be separated from the above-mentioned tumor mass, which embraces its lower pole and extends along the inner border of the kidney with a process toward the hilus. The pelvis is slightly more dilated than that of the left kidney. The appearance of the cortex and medullary substance is about the same as in the left kidney, only the medullary substance appears more narrow.

Liver. Shows a smooth, glistening surface, is normal in size, slightly congested, cut surface of a mottled appearance.

Here we have a tumor, clinically identical with sarcoma, microscopically pronounced typical Hodgkin's disease by a most competent pathologist, running a course identical with a true neoplasm, invading the surrounding tissue, fascia, muscle, periosteum, and bone itself. In spite of all this, most pathologists do not accept the neoplastic nature of Hodgkin's disease, but incline to regard it as a disease of infectious origin, and here is the crux of the whole question. The pathologists who most strongly oppose the microbic origin of malignant tumors, when they find a group of tumors, *e. g.*, in Hodgkin's disease, essentially malignant in every clinical feature, forming metastases, infiltrating surrounding tissues, and killing the patient, precisely as in a malignant tumor, yet, because in this group of tumors there is slightly stronger evidence of microbic origin, refuse to admit them into the class of true neoplasms. This is really begging the question.

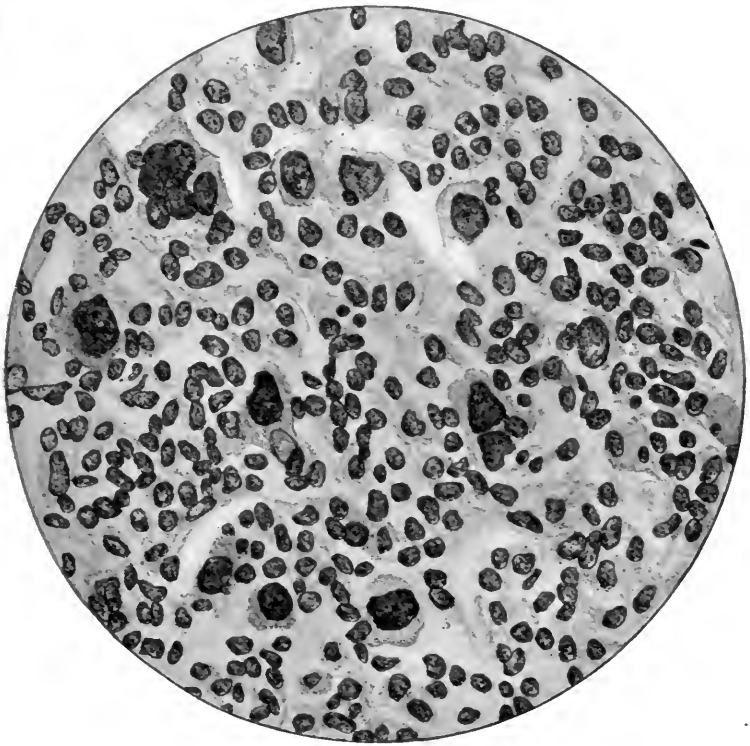
CASE II.—*Hodgkin's disease; clinical diagnosis confirmed by microscopic examination; entire disappearance of lymphatic and splenic enlargement under two months' treatment with mixed toxins of erysipelas and Bacillus prodigiosus, without other treatment. Patient perfectly well at present, seven months later.* G. K., aged twenty-four years; negative family history. In October, 1906,

first noticed enlargement in the glands on the right side of the neck. The swelling was at first confined to one gland; later a number of neighboring glands became involved, until the entire chain from the mastoid to the clavicle was affected. There was only slight enlargement on the other side. About six months later a similar enlargement in the axillary and both inguinal regions became apparent. His general health began to fail, and he lost 20 pounds in weight. The patient was admitted to the General Memorial Hospital on October 10, 1907, at which time he weighed 165 pounds. Physical examination on admission showed a tumor mass occupying the whole right cervical region, from mastoid to clavicle and from the median line in front to nearly the median line behind. The tumor is made up of nodules varying in size from a hazelnut to an English walnut, more or less discrete, but loosely attached to one another as well as to the underlying and overlying structures. Examination of the axillæ showed similar enlargement of the glands on both sides, the largest being the size of an egg. Both groins were also occupied by similar glandular tumors, the largest being the size of an English walnut. The spleen shows marked enlargement, extending about two inches below the costal arch; liver slightly enlarged. Blood count showed the following

October 11, leukocytes, 4050; red blood cells, 4,070,000; polynuclears, 62 per cent.; large lymphocytes, 18 per cent.; small lymphocytes, 17 per cent.; transitionals, 3 per cent.

The clinical diagnosis of Hodgkin's disease was made by Dr. W. K. Draper, who saw the case before the treatment was begun. The patient was immediately put upon the mixed toxins of erysipelas and Bacillus prodigiosus, without other treatment. Systemic treatment only was given, all injections being made into the pectoral region. The patient showed an extraordinary susceptibility to the toxins. The initial dose of $\frac{1}{4}$ mm. was gradually increased to $1\frac{1}{2}$ mm., which latter dose produced a temperature of 105.6° Up to November 15 he had received 14 injections. At the end of two weeks the tumors in the axillary and inguinal regions had almost entirely disappeared; the spleen had diminished in size so that it was hardly palpable; the neck tumors had decreased two thirds.

At the end of this time one of the glands, about the size of a hickory nut, was removed and examined by Dr. W. C. Clark, the pathologist of the General Memorial Hospital, and by Dr. Jas. Ewing, professor of pathology at Cornell Laboratory. Both pronounced it typical Hodgkin's disease of the giant-celled type.



At the end of two weeks the patient developed toxemia, and ran a temperature of 102° to 103° nearly every day for upward of a week, during which time the treatment was suspended. After the attack had subsided the injections were resumed in smaller doses. November 20, or about five weeks from the time of his admission to the hospital, all tumors had disappeared.

The treatment was continued to the end of November. The patient was so exceedingly susceptible and so profoundly prostrated

by even small doses of the toxins that he was seldom able to take more than two or three injections a week. He suffered from very severe general muscular pains, particularly localized in the lumbar region. Toward the end of November the cervical tumors showed very slight increase in size, and the dose of the toxins was again increased. The patient then left the hospital for a few days rest, but did not return. I had lost sight of him up to two days ago, when my assistant, Dr. D. H. M. Gillespie, succeeded in tracing him. He found him in perfect health; he had gained 40 pounds in weight and had resumed his work. Careful examination revealed no swelling in the axilla or inguinal regions and no enlargement of either spleen or liver. The patient stated that his local physician had given him some medicine, the nature of which I was unable to ascertain.

The further blood examinations in this case showed the following: October 25, 1907, leukocytes, 12,000; red cells, 4,440,000; polynuclears, 84 per cent.; large lymphocytes, 7 per cent.; small lymphocytes, 8 per cent. November 1, 1907, leukocytes, 4200; red cells, 4,410,000; polynuclears, 81 per cent.; large lymphocytes, 3 per cent.; small lymphocytes, 15 per cent.

For the report of the following case of Hodgkin's disease, which was treated with the mixed toxins, under my direction, at the Roosevelt Hospital, I am greatly indebted to Dr. Walter B. James, attending physician, and Dr. Hodenpyl, the pathologist to the hospital.

CASE III.—J. S., male, aged eight years, was admitted to Roosevelt Hospital October 28, 1905 (transferred from second surgical to medical division), with the following history: Father and mother living and healthy.

Present History. Sixth child, the others all living and well. No tuberculous or rheumatic history obtainable. Patient had measles seven years ago. The present illness started when he was one and one-half years old; a small lump was noticed in the neck behind the left ear. This grew steadily, and other similar tumors appeared three years ago when the patient was five years of age. Several of these were removed in Europe, only one remaining

behind the left clavicle. Two months after this the glands again began to increase in size, and have shown steady enlargement ever since. There is no impairment in respiration. General health good. Re-admitted to the hospital October 24, 1907; then ten years of age. The glands have steadily increased in size since his previous stay in the hospital two years ago. Temperature, 100.6°; pulse, 108; respirations, 20. Measurements of the glands in the cervical region, $4\frac{3}{8}$ inches vertically and $4\frac{3}{4}$ inches transversely. The left inguinal glands were similarly enlarged, measuring $3\frac{1}{2}$ by $4\frac{7}{8}$ inches.

The patient did not show the appearance of serious illness. He was undersized, fairly well nourished; face full; made fuller by a large tumor mass under the left jaw and encroaching upon the face. The legs were very small; he limped with his left foot. Color normal; cheeks red; lips not anemic; pupils equal and react to light; ears normal; tongue moist; throat clear; mouth in fair condition. Heart seemingly normal in size and in normal position; heart action regular; pulse regular, normal rate. Lungs are difficult of examination, because tumor masses cover left apex, scapular region, and upper axilla. Right chest seems normal to percussion, palpation, and auscultation. Over the left chest in the region of the apex and in front over the first and second interspace and behind in the left portion of interscapular space the breathing sounds are diminished through vesiculas. The note seems dull, and the tumor masses add to the thickness of the chest wall. Voice is fuller and more nasal than on the opposite side; fremitus diminished. Abdomen prominent, pot-bellied, soft, tympanitic. No tenderness; no masses felt on deep palpation. Liver shows increased dulness, and edge is felt below the costal margin. Spleen is also slightly enlarged. In the left groin there is a swelling about $2\frac{1}{2}$ by 3 inches, extending to Poupart's ligament above and inward to inner side of thigh. The tumor is made up of large, irregular masses which feel like enlarged glands, tender to pressure, showing no fluctuation, unattached to skin, loosely attached to deeper parts. Leg is held in a position of some flexion; extension possible, but somewhat painful.

On the under side of left jaw, extending up over the jaw on the face, in front of and behind ear, and downward to middle of neck, there are similar masses the size of an orange. In the left axilla there is a mass the size of a tennis ball; the skin over it is reddened. There are also similar masses, $3\frac{1}{4}$ by $2\frac{1}{2}$ inches, behind and to the inner side of the left clavicle. Numerous smaller masses are found in the lower cervical region on the left side and over the shoulder in front and behind, giving the shoulder a padded appearance. There are also similar masses in the right knee. Other smaller masses more discrete over the right neck region, the size of walnuts. A few discrete glands are found in the right axilla. The right groin is free; epitrochleas not enlarged.

In general the swellings are irregular in contour and the skin is normal. They are irregular to touch, presenting moderately hard masses, some large, others small. The larger, from the size of a walnut to that of an egg, seem composed of smaller masses joined together. The smaller are rather hard, well defined, movable on the deeper parts. The larger are attached to the deeper parts. The masses in the left groin and left axilla are tender; the others very slightly tender. No fluctuation is obtained, but the masses in the left axilla feel softer than the others. Some seem attached to the skin, except the large mass in the left neck around the jaw. It there presents a transverse scar about $2\frac{1}{4}$ inches long (the site of the former operation). The skin shows many dilated veins over the upper and outer part of the left chest.

The injections with the mixed toxins were begun on November 8, the initial dose given being $\frac{1}{5}$ mm. This was gradually increased up to the point of getting a moderate reaction, a temperature of 102° to 104°. The injections were all systemic. At this time the patient had been in the hospital about two weeks. The disease was steadily progressing, and very little effect was observed from the treatment; no marked diminution in size occurred. The patient's general condition continued to decline, and on my advice the toxins were discontinued on December 24. The boy died on January 25, 1908. Autopsy, made by Dr. Hodenpyl, pathologist to the hospital, showed the following:

Body emaciated, showing numerous glandular masses. Neck enlarged to one-half greater diameter than head by glands in submaxillary region. Right axilla not involved. Left shows mass size of large orange, with two ulcers size of twenty-five cent piece. Large mass, size and shape of adult heart, in left inguinal region. Right not involved. Head of left tibia shows a mass the size of a walnut. Right leg very slightly edematous, left markedly.

Lungs, liver, kidneys, spleen, pancreas, heart, and intestinal tract not involved; left lung adherent posteriorly at the base. Pericardium adherent throughout.

Large mass of glands, the size of grape fruit, involving sternum at upper portion, projecting anteriorly and posteriorly into mediastinum.

Double chain of glands down entire length of spine.

Abdomen. Purulent peritonitis in lower part, especially on right side. Mesentery lower and small glands.

Pelvis filled with mass of glands continuous with large mass in left iliac fossa and through latter, with mass in inguinal region. All larger glands broken down to greater or less extent. Smaller glands show areas of necrosis suggestive of T. B. C.

Anatomical Diagnosis. Hodgkin's disease.

A very careful microscopic examination was made by Dr. Eugene Hodenpyl, who pronounced it Hodgkin's disease. His report states: "The microscopic examination of the lymph nodes showed fairly well the characteristic lesions of Hodgkin's disease of a rather chronic, *i. e.*, fibrous type. Many of the larger nodes were infected and broken down; some showed necrotic areas, which were carefully stained for tubercle bacilli, but with negative result. Two pigs were inoculated, also with negative result. There was no involvement of any of the viscera, including the gastro-intestinal tract."

CASE IV.—C. T., aged twenty-one years. Family history negative, except that two maternal aunts had died of tuberculosis.

Present History. Had ordinary diseases of childhood, diphtheria and pneumonia when five years of age; the latter again when fifteen years of age. The patient drank considerably for two

years; stopped a few months ago. No venereal history. In 1905 he first noticed an enlargement of the glands on the right side of the neck, which were removed by Dr. W. L. Huggins, of Los Angeles, in February, 1906. The glands were found encapsulated, more or less discrete, without evidence of caseous degeneration. Blood examination made by Dr. J. N. Vander Veer showed: Hemoglobin, 85 per cent.; leukocytes, 7450; reds, 6,720,000; large mononuclears, 4 per cent.; small mononuclears, 10 per cent.; polynuclears, 70 per cent.; transitionals, 4 per cent.; eosinophiles, 12 per cent.

The trouble recurred, and in February, 1907, Dr. Huggins performed a second operation, which was again followed by recurrence. No microscopic examination was made.

On September 15, 1907, the patient was referred to me for an opinion. At this time the right cervical region was occupied by a tumor made up of several distinct nodular masses, the largest the size of a goose egg, more or less discrete, freely movable upon the deep parts, not attached to the skin.

I made a clinical diagnosis of Hodgkin's disease, and advised a trial with the mixed toxins of erysipelas and Bacillus prodigiosus. For a time there was considerable general improvement, as also marked decrease in the size of the tumor masses, but this proved only temporary. The *x*-rays were then tried for several months, but in spite of the treatment the neck tumor as well as the glands in the axilla increased in size. The patient was then referred to Dr. A. W. Elting, of Albany, who, early in February, 1908, performed an extensive dissection on the right side of the neck, removing all of the diseased tissue with the exception of the submaxillary triangle and right axilla. Two weeks later the submaxillary triangle and right axilla were cleaned out. He made a good recovery from these operations. The specimens removed at both operations were carefully examined at the Bender Laboratory and pronounced typical Hodgkin's disease.

The close relationship of Hodgkin's disease and leukemia to sarcoma is further evidenced by the similar action exerted upon these conditions by the *x*-rays and toxins, as demonstrated by the following briefly reported case, for the data of which I am indebted to Dr. J. F. Lyon:

CASE V.—Mrs. D. K. came under the care of Dr. Lyon February 10, 1907, for the treatment of glandular and splenic leukemia. The glands of neck, axilla, and groin were much enlarged. Spleen and liver extended 3 to 4 inches below the ribs. The patient was sent to Dr. W. J. Morton February 11, 1907, for *x*-ray treatment, which was carried out, with occasional intervals of rest for a period of ten months. The first blood count made by Dr. M. A. Mason, of this city, was as follows: February 12, reds, 2,800,000; whites, 98,000; hemoglobin, 45 per cent.

Subsequent blood examinations made by Dr. H. T. Brooks, pathologist to the New York Post-graduate Hospital, while the patient was under the *x*-ray treatment, showed the following: February 23, reds, 2,029,000; whites, 464,000; hemoglobin, 40 per cent. March 30, reds, 2,215,000; whites, 611,271; hemoglobin, 40 per cent. May 21, reds, 2,537,000; whites, 630,000; hemoglobin, 55 per cent.

In the latter part of May, 1907, the patient developed an attack of erysipelas, and the marked and rapid improvement which occurred thereafter suggested to Dr. Lyon the possibility of further improvement under the mixed toxins. I saw this case in consultation on September 12, 1907. The patient at this time was considerably jaundiced; the spleen was markedly enlarged. The cervical, axillary, and inguinal regions were occupied by large glandular masses, the condition found presenting the typical picture of Hodgkin's disease. The mixed toxins of erysipelas and Bacillus prodigiosus were begun, and the dose gradually increased from $\frac{1}{4}$ to 3 mm., which dose produced a chill and temperture of 103° to 104°. At the end of about three weeks' treatment the blood count showed a reduction in the number of leukocytes by more than 100,000, and also a decided reduction in the size of all the glands. In January, 1908, the patient developed a second very severe attack of erysipelas, to which, at the end of nearly three weeks, she succumbed.

In connection with the foregoing case, the two cases of leukemia reported by Dr. Ralph C. Larrabee in the *Boston Medical and Surgical Journal*, February 6, 1908, in which he used the mixed toxins, may be of interest.

Experience thus far has shown that patients suffering from Hodgkin's disease and leukemia are exceedingly susceptible to the toxins, being unable to stand more than very minute doses.

In Hodgkin's disease, as well as in leukemia, I believe that we have a group of tumors which, while they have many of the characteristics of infectious disease, have, on the other hand, certain very definite clinical and anatomical features which point even more strongly to a neoplastic origin.

In view of this strong clinical evidence in favor of such origin, it would seem illogical to exclude Hodgkin's disease from the class of malignant tumors simply because it resembles an infectious process a little more closely than the ordinary types of malignant tumors. With more reason might we say that the fact that this group of cases is of probable infectious origin adds still further to the already increasing weight of evidence that the whole group of sarcomatous tumors are also of infectious origin.

We now know, from the experiments of Beebe and Ewing, that the lymphosarcomas of dogs, acknowledged to be of infectious nature and, until recently, believed by the majority of pathologists to be infectious granuloma, have been finally classed as true sarcomas.

While the multitudinous varieties of malignant tumors, as classified by pathologists, would apparently point to a great variety of specific causes, if we assume a microbic origin, a careful study of the question tends to strengthen the theory held by Ballance, of London, that all these varieties may be due to a single microbic cause, which, under varying conditions, gives rise at one time to proliferation of connective tissue cells, at another to epithelial, and at another still to endothelial cells.

Strong evidence in favor of the essential unity of malignant tumors is found in the recent discoveries of Ehrlich and Loeb in their investigations in mouse tumors. Ehrlich found that in successful transplantation of mouse carcinoma in the twelfth generation a typical carcinoma became transformed into a sarcoma.

Louis Loeb observed the same transformation of carcinoma in a Japanese mouse to sarcoma in the second generation. There

have already been two instances of sarcoma and carcinoma developing within an inch of each other under the stimulating effects of the *x*-rays. I have myself observed two cases of primary carcinoma with metastatic recurrences that were typical sarcoma; and, vice versa, two cases of primary sarcoma with recurrent carcinoma (one local, one metastatic).

Conclusions.

1. The clinical features of Hodgkin's disease are often so nearly identical with those of round-celled sarcoma that it is impossible to differentiate the two conditions.

2. The histological features so closely resemble sarcoma that, if a given specimen be examined by different pathologists, opinions would be about equally divided between Hodgkin's disease and sarcoma.

3. The onset of the disease, its course and duration, formation of general metastases, and final going on to inevitable death, most closely simulate sarcoma.

4. While in most cases the metastases occur in preëxisting lymph gland tissue, this is by no means always true, since in some cases, *e. g.*, Gibbons' and my own, the tumor breaks through the capsule, infiltrates the surrounding tissues, fascia, muscle, periosteum, and the bone itself.

5. The fact that Hodgkin's disease and leukemia have certain features pointing to an infectious origin should not exclude them from being classed as malignant tumors; but, on the contrary, this fact furnishes additional evidence in favor of the infectious origin of sarcoma.

6. In view of the utter hopelessness of Hodgkin's disease, as well as leukemia, from surgical and medical treatment, and in view of the remarkable results obtained, though in a very limited number of cases, with the *x*-rays and toxins, the best chance of success apparently lies in a wider application of these methods of treatment, either singly or in combination.

Bibliography.

1. Dorothy Reed. Johns Hopkins Med. Reports, 1902, vol. x, 133.
2. Charles F. Martin. Journal of Medical Research, July 1901, p. 249.
3. Channing C. Simmons. Ibid., June, 1903, p. 378.
4. Hy. Walter Gibbons. American Journal of the Medical Sciences, November, 1906.
5. Sternberg. Zeitschrift f. Heilkunde, 1898, xix, p. 21.
6. Banti. International Clinics, iii, Series 16.
7. Pfeiffer. Tübingen Klinik, Bruns' Beiträge zur klinischen Chirurgie, 1906, p. 263.
8. Longcope. Bulletin Ayer Clin. Laboratory, Pennsylvania Hospital, 1903, No. 1.
9. La Roy, of Gand. Archives Internationales de Chir., 1907, vol. iii, fasic. 6.
10. Stengel and Pancoast. Jour. Amer. Med. Assoc., April 25, 1908.

A UNIQUE ANOMALY OF THE GREAT OR GASTROCOLIC OMENTUM.

By WILLIAM M. MASTIN, M.D.,
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Lee B., male, aged twenty-six years, a muscular negro of a pronounced Guinea Coast or Congo type, was admitted to the Surgical wards of the Mobile City Hospital, July 15, 1904, suffering from a penetrating shot wound in the left lumbar region, about three inches to the outside of the vertebral spines and two inches above the iliac crest. The wound had been inflicted by a gun loaded with No. 4 shot, and was delivered at close range, as indicated by the shell wads lodging in the soft tissues of the back. The injury had been received some fifteen hours before admission; symptoms of intestinal perforation were marked; and his general condition was extremely bad.

Celiotomy was performed at once, the abdomen being opened in the mid-line below the umbilicus. The cavity was filled with blood and intestinal contents, and eight perforations of the intestines—four in the small gut and four in the under surface of the transverse and descending colon—were found and sutured. Encountering some difficulty in bringing the colon into the wound, due to what seemed to be extensive and unyielding adhesions between the omentum and the abdominal parietes, the incision was extended some distance above the umbilicus to secure more space and at the same time for examination of the contents of the upper abdomen. It was now discovered that the apparent adhesions consisted of the anomalous omentum, misplaced and shortened, which extended as a diaphragm across the entire abdomen, shutting

off completely the upper abdominal space with its contents from the remainder of the abdominal cavity. This omental partition was much denser than the normal tissue of the omentum; its surface was smooth and glistening, like the parietal peritoneum, and with which it was continuous and inseparable. It was decidedly vascular, bleeding freely when incised. There was no evidence of any ancient peritoneal inflammation, there were no adhesions or bands anywhere, and the viscera were quite normal in appearance and position.

The critical condition of the patient rendered it necessary to desist from further exploration, and the abdomen was closed and the lumbar wound drained. Death resulted four days later from septic peritonitis.

Autopsy. The autopsy was performed a few hours after death by Dr. Douglass G. Campbell, of the Assistant Staff. General septic peritonitis existed. There were three perforations of the posterior wall of the transverse and descending colon (which were not within surgical reach under the existing conditions), and one in the small intestine, not discovered at the operation. The left kidney had a small, superficial, furrowed wound in its lower pole. None of the other organs were injured.

The chief feature was the anomaly of the great omentum, which formed a perfect partition, dividing the abdominal cavity into two distinct spaces, the upper and smaller space containing the liver, stomach, pancreas, and spleen (the kidneys being normally situated postperitoneal, but within this limit), and the lower space holding the small intestines and under surfaces of the ascending, transverse, and descending colon, the cecum caput coli with the vermiform appendix, the sigmoid, and, of course, the pelvic organs.

The relations of the omentum to the stomach and transverse colon were apparently normal, but instead of stopping with these natural limitations the omentum continued on in unbroken attachment to the colon on each side, arching down in a manner similar to the curve of the true diaphragm, until the lateral abdominal walls were reached, with which it became a part. Thus, on the right side the border of the omentum extends normally as far

only as the duodenum, but in this case it continued on in its colic attachment and merged into the ascending mesocolon and mesocecum, by means of which it was connected with the posterior and lateral abdominal walls. The same anatomical association existed on the left side, the left border of the omentum blended normally with the gastrosplenic omentum, but also continued on into the descending mesocolon and mesosigmoid and through these effecting its posterolateral attachments. From these posterior and lateral attachments the omental diaphragm extended in front across the entire anterior abdominal wall, forming a complete partition as described. The omental diaphragm was not wrinkled or in folds, but somewhat tense, and the colon was held more rigidly than natural. The usual fatty consistency and cribriform appearance of the omentum was absent, and, instead, the tissue was dense, rather fibrous, resembling the peritoneal reflections forming the suspensory ligaments of the abdominal organs, and both the superior and inferior surfaces presented the appearance of peritoneum and were indistinguishable from it. The attachment to the anterior abdominal parietes at the median line was at a level of two and a half inches below the xiphoid appendix, but gradually arched downward and backward on either side to the points already designated. When incised it was seen to be composed grossly of two distinct peritoneal layers, which anteriorly merged into and were continuous with the peritoneum of the abdominal walls, the upper layer being reflected upward and the lower layer downward. Enclosed between these peritoneal layers was a dense layer of adipose tissue which was continuous with the preperitoneal abdominal fat (see diagram), and which was mistaken for such when cut into at the operation. The four peritoneal layers of the normal omentum could not be demonstrated by rough dissection. This false diaphragm varied in thickness from about one-fourth to one-half inch or more, the thinnest part corresponding to its gastric and colic attachments, and the thickest part where it united with the abdominal walls.

This case is a conspicuous example of the many surprises to be met with in the abdomen, and it seems to be without a parallel

in the annals of medicine. So far as I have been able to ascertain, no instance of a like anomaly exists in the literature. After a fruitless search through my own private library, the services of Dr. Von Klein, the well-known medical collaborator, was secured, and he states that "after a thorough research from the fifteenth century to date, I now report to you that there is not a similar case in literature, nor in the illustrations of the numerous atlases on anomalies."

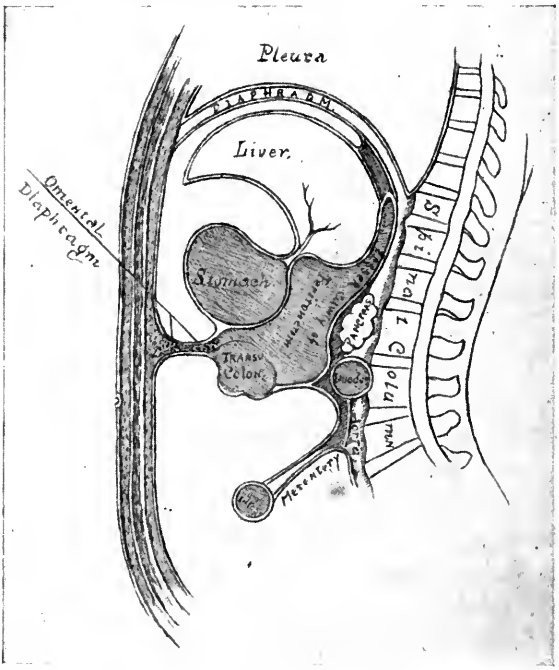

Diagram showing the relations of the omental diaphragm to the anterior abdominal wall.

In addition to the peculiarities noted, it is obvious that the important office of the great omentum, as the chief guardian or protector of the abdominal viscera, was lost. The pendulous or apron-like folds not existing, necessarily the omental (or lesser peritoneal) cavity was largely curtailed, and, furthermore, the special functions of the omentum, of maintaining the warmth of

the intestines and erecting barriers against germ invasion and limiting foci of infection, were entirely destroyed. This latter was evident in the general septic peritonitis that existed throughout the cavity.

It is to be regretted that circumstances prevented a more complete and accurate anatomical examination, especially of the lesser omentum and the relations of the organs contained in the upper abdomen.

PRIMARY CARCINOMA OF THE FEMALE URETHRA.

By LEWIS S. McMURTRY, A.M., MD.,
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My interest in this subject was awakened by the following case:

Case I.—Mrs. E. M., white, aged forty-seven years, mother of two children, the youngest eighteen years of age. Family history good, and the personal history exceptionally free from illness. The menstrual history was normal, and pregnancy and labor uncomplicated. This woman was referred to me by her family physician on September 17, 1906, on account of a growth of the urethra, which at first was regarded as a caruncle, but resisted all the usual treatment for that common form of growth. A general examination of the pelvic organs was negative. The menopause had been passed one year, and was without any unusual phenomena. The uterus was normal in position and otherwise, and the vaginal outlet was free from lacerations. There was no vaginal discharge.

The patient first consulted her physician in February, 1906, about seven months before I saw her at the date above mentioned. When she first consulted her family physician she complained of painful micturition, with some burning sensation at the meatus, and directed attention to a growth at that site. The growth was diagnosticated as a caruncle of the urethra, and was treated by clipping it off with scissors, followed by frequent applications of solid stick of nitrate of silver. This failed to produce the desired relief, the result being frequent bleeding and an acrid discharge. The growth persisted and increased in size. When I examined the patient the growth was about the size of a chestnut, protruding from the meatus. It was sessile, and evidently sprang from the

floor of the urethra and extended itself outside the meatus. The surface was grayish in color, which was doubtless the result of the repeated applications of nitrate of silver; the growth entirely covered the meatus; there was no ulceration and it was free from induration. It bled freely when touched. The persistence of the growth after cutting it away with scissors and repeated cauterization suggested a diagnosis of cancer, which was confirmed by my examination. The constant and marked tendency to bleed upon the slightest touch I regarded as most significant.

On September 18, the day following my first examination, under ether anesthesia, the urethra was freely excised up to the sphincter muscle. The incision was carried well away into apparently sound tissue. No attempt was made to suture the urethra, and after arresting all bleeding, a simple gauze dressing around a retained catheter was applied. The parts healed kindly, and there was perfect control of the bladder throughout. The patient improved markedly for a year, and her physician wrote me that she was quite healed, and reported from time to time her favorable progress. Fifteen months after the operation, however, the doctor advised me of the return of the disease, which involved the neck of the bladder. The patient refused to submit to any further operative treatment, and the disease has slowly advanced, involving at the present time the bladder, perivesical structures, and inguinal glands.

The growth, as excised, was submitted to Dr. John E. Hays, who made the following report and photomicrographs: "This growth consists of well-formed connective tissue, holding glands, bloodvessels, and a small amount of unstriated muscle fiber. The glands are of the simple tubular type, and are dilated and tortuous. The epithelium lining them is of the columnar variety; some of the tubes are nearly normal in structure. However, most of the tubes have several layers of cells lining them, and some are so crowded with epithelial cells that no lumen is visible. In these tubes the cells vary in character, losing their distinct columnar type and becoming cubical. These cells also vary in their reaction to stain, some staining deeply and others very lightly. The epithelia from these glands break through the basement membrane and have irreg-

ular columns of cells in the surrounding tissue. When these columns are cut transversely, they show in the sections as rounded masses —nests of cells. This growth is adenocarcinoma" (Figs. 1 and 2).

CASE II.—On March 12, 1907, I was consulted by Mrs. W. K., white, aged twenty-six years, widow, concerning a painful growth of the urethra. The patient is a small woman, weighing 102 pounds, but well nourished. The general health had been uniformly good since childhood, with the exception of an attack of

FIG. 1.—Case I.

typhoid fever three years previously. She had never conceived. The pelvic organs were normal, menstruation regular. She complained of very severe pain upon micturition, with persistent burning sensation. A bloody discharge had been observed from time to time. She stated that the tumor had been removed twice by her physician, once under general anesthesia. An examination revealed a small sessile growth of the urethra protruding from the meatus. The resemblance of the growth in its general character and appearance to that found in the case just reported, and the fact

that it had been reproduced after removal, led me to suspect it to be malignant in character. After repeated examination and treatment with detergent applications, I became convinced that it was malignant, and urged thorough excision. The operation was done on April 5, 1907, under ether anesthesia. The urethra was excised with the growth, the incision giving wide margin of healthy tissue. The mucous membrane of the urethra was sutured to that of the vagina with silkworm-gut sutures and a retention catheter

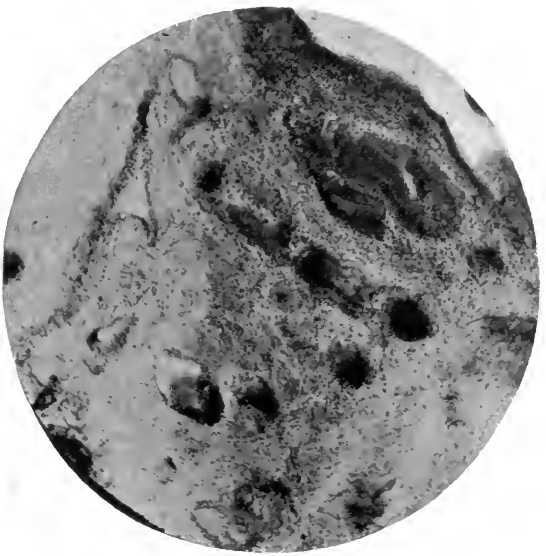

FIG. 2.—Case I.

placed in the bladder. The catheter was removed on the sixth day. The control of the bladder was perfect, and the patient left the infirmary on the twelfth day after the operation. I examined this patient on March 18 of the present year, almost one year since the operation, and found her in excellent condition. She has had no indication of return of the growth, is free from pain or inconvenience, and the parts appear quite healthy.

I submitted the excised growth to Dr. Hays, who made several sections and pronounced it adenocarcinoma. He made the pho-

tomicrograph herewith, which shows the same process of glandular cell proliferation as in the preceding specimen, but in a *much earlier stage of the invasion* (Fig. 3). Doubtless the present encouraging condition of the patient as to recurrence is due to the fact that excision was done in the incipiency of the malignant process. Dr. Hays thus describes the appearance of the tissues: "On section, this growth is shown to be made up of a stroma of connective

FIG. 3.—Case II.

tissue, surrounding simple tubular glands, unstriated muscle fibers, and bloodvessels. The gland tubes are abnormal in that they are dilated, tortuous, and present an infolding of the walls. There is also a proliferation of the lining epithelium, the inner layer being of columnar type and the other cells tend toward a transitional type. There is a distinct lumen in all the tubes, and around them is a considerable infiltration of small round and polymorphonuclear

cells. While there is not absolute histological evidence of carcinoma, yet from the numbers of layers of epithelial cells lining the tubes, and the abnormal form of these tubes, I believe a transition from adenoma to adenocarcinoma is in progress."

An investigation of the literature of neoplasms of the female urethra disclosed that I had come upon two cases of carcinoma in the rarest location. A search for information upon the subject in the standard text-books will prove most disappointing. As a rule, even modern encyclopedic treatises on surgery make no mention of cancer in this location. Likewise, in modern works upon gynecology the subject barely receives brief mention. Of text-books upon gynecology of comparatively recent date, that of Alexander Skene has the most elaborate chapters on the diseases of the female bladder and urethra. Skene's original work in this field of gynecology is well known. In the section on Urethral Neoplasms, he says: "The existence of cancerous disease of the female urethra as a primary affection is doubted by many authors, but it probably does occasionally occur. Indeed, as a secondary disease it is quite rare, for, when extending from the uterus or neighboring organs to the bladder, death, as a rule, results before the urethra is involved." The very recent and complete treatise on gynecology by J. Clarence Webster makes slight mention of cancer of the urethra, without discussion of the subject. In the treatise of Kelly and Noble on *Gynecology and Abdominal Surgery*, just issued, scarcely half a page is devoted to the consideration of urethral carcinoma.

In 1898 but two cases were reported in the Index Catalogue of the Surgeon-General's Office, at Washington, one of these being by Dr. T. Gaillard Thomas, of New York, and the other by Jobert, of France. The first extensive study of this subject, with investigation of the literature, was made by Melville Wassermann, and published in Paris in 1895. This writer made a report of twenty-four cases. In 1903 one of our own countrymen, Dr. J. F. Percy, of Galesburg, Illinois, presented to the Chicago Gynecological Society a report of a case of "primary carcinoma of the urethra in the female," and accompanied it with the most thorough and pains-

taking study of all the literature on the subject which has yet appeared in any language. Indeed, this report is a model of scientific investigation of a surgical subject. This author made a thorough analysis of Wassermann's paper, and found that many of the cases reported by him should not have place in a tabulated list of primary carcinoma of the female urethra. In several cases the disease of the urethra was undoubtedly secondary to carcinoma in adjacent structures. In one case in Wassermann's series the clitoris was involved, and there was no evidence to show that it was not the original locus of the disease. In other cases no microscopic examination was utilized to demonstrate the character of the growth. Percy's investigation of the original reports of the twenty-four cases in Wassermann's list demonstrates that only three of the entire list were undoubtedly cases of cancer primarily developing in the urethra.

M. Jobert, after reporting his own case, states that he is aware of only two cases which have been previously reported. His case was reported in 1852, and his description is an admirable presentation of a case of carcinoma originating in the female urethra. The first reported case mentioned by Jobert is by Madam Boivin, a familiar name in classic obstetrical literature. This case was treated by Madame Boivin in 1828, and is described in her treatise in two volumes, and accompanied with an illustrative plate. It is an accurate report of a primary growth in the urethra, the patient dying later of cancer of the stomach.

After careful analysis of all reported cases in all languages, Percy tabulates sixteen cases of unquestioned primary cancer of the female urethra, including his own case. This list includes every case from the report of Madame Boivin, in 1828, down to 1902. Accepting Percy's table as being accurate, I have made a careful search of literature since the date of the publication of his paper, and have appended to this article the cases which have been reported since that time. They are eight in number, and, with the two of my own here reported, make ten in all. This number, added to the sixteen of Percy's list, brings the number of reported cases down to date to twenty-six. I find in the literature numer-

ous cases of sarcoma of the female urethra, some of which are exceptionally interesting. Two are reported by Kelly in his work on *Operative Gynecology*, and another of exceptional interest has been reported by Dr. Chas. A. L. Reed, in the *American Journal of Obstetrics*, in 1906.

The diagnosis of cancer in this location presents some difficulties. Urethral caruncle is so common in women that the early lesion of cancer is almost invariably mistaken for caruncle. Both Hyde and Taylor have called attention to the close resemblance between certain syphilitic lesions and carcinoma in the female urethra. These two diseases are to be considered in this connection.

I am sure I need say nothing in this presence as to the prognosis of this particular form of cancer. Its gravity is the same as in other parts of the body, being no greater and no less. In its treatment the same principles are to be applied as in other locations. In the present state of our knowledge no treatment can avail except free and complete excision. In advanced cases the base of the bladder has been removed and a suprapubic urinary fistula established. In some other cases an artificial vesicovaginal fistula has been utilized. When such operations are applied, however, the case is practically within the border line of the inoperable class. The great desideratum for successful treatment is habitual examination of all cases applying to the physician with painful micturition, early diagnosis of malignant types of disease, with complete excision in that early stage of invasion when complete cure is possible. It is with a view to promote such routine examination and early recognition of malignant disease in the female urethra that I have prepared this paper.

TABLE OF CASES OF UNDOUBTED PRIMARY CANCER OF THE FEMALE URETHRA.

Case.	Reporter.	Date.	Age.	Duration.	Treatment.	Operation.	Results.	Tumor.	Remarks.
1	Mme. Boivin.	1828	40	3–4 yrs.	Urethral suppositories containing opium for 15 days and excision with curved scissors.	.....	.....	Fungous tumor of the urinary meatus.	Died later in Holland of cancer of the stomach.
2	Jobert.	1852	56	?	Surgical.	Excision of tumor.	?		
3	Thomas.	1877	29	2 mos.	Surgical.	Resection of urethra by galvanocautery.	No recurrence after some months.		
4	Von Winckel.	1878	58	?	Surgical.	Resection of urethra.	No recurrence at end of 3 years.		
5	Low.	1888	46	2 yrs.	Surgical.	Excision of tumor.	No recurrence at end of 6 months.	.....	Several operations for recurring urethral polypi.
6	Reed.	1895	64	8 mos.	Surgical.	Wide extirpation of the growth.	Good condition for 7 months; recurrence in stomach.	Melanosarcoma.	Died 1 year and 8 months after discovery of growth.
7	Hottinger.	1896	65	?	No treatment.	.....	.....	Pavement epithelium carcinoma.	At last report patient was in bad condition and failing; at first examination inguinal glands not enlarged.
8	Beigel.	?	50	5 yrs.	Surgical.	Extirpation with scissors.	Final result not stated.	Sarcoma of urethral orifice.	

9	Ehrendorfer.	1891	52	6½ yrs.	Surgical.	Tumor was removed without touching the inner urethral mucosa.	Patient completely cured.	Round-celled sarcoma.	
10	Oviatt.	1893	47	?	Surgical.	Preliminary suprapubic cystotomy; in 2 weeks resection of entire urethra, together with a portion of neck of bladder and removal of inguinal glands.	Comparative comfort for 10 months; recurrence in bladder and death 4 months later.	Carcinoma.	Began as hard nodule, involving lower segment of the meatus; this was in June; in September following there was a marked extension of the disease and involvement of inguinal glands.
11	M. Price.	1894	?	?	Surgical.	Free excision of the growth.	Died of acute pneumonia 2 years after operation; no recurrence.	Epithelioma.	Developed in woman subject of complete laceration of the perineum of 30 years' duration.
12	Galabin.	1896	3	?	Cautery.	Removed by galvanocautery.	Died in one week after leaving hospital.	Pedunculated myxosarcoma 3 inches in diameter.	
13	Ochsner, A. J.	1898	50	?	Surgical.	Extirpation of urethra; was careful not to remove internal sphincter.	No recurrence 2 years after; good functional result.	Epithelioma.	Inguinal glands not enlarged.
14	Percy.	1898	38	7 mos.	Surgical.	Excision of anterior three-fourths of urethra and closure of bladder with suprapubic drainage.	Recurrence in 3 months.	Epithelioma.	At time of operation tumor was first removed by torsion; about three-quarters of the urethral mucous membrane came with it.

TABLE OF CASES OF UNDOUBTED PRIMARY CANCER OF THE FEMALE URETHRA (*Continued*).

Case.	Reporter.	Date.	Age.	Duration.	Treatment.	Operation.	Results.	Tumor.	Remarks.
15	Vineberg.	1900	36	6 mos.	Surgical.	Wide extirpation of the growth.	No recurrence up to Jan., 1902.	Flattened-celled carcinoma.	Inguinal glands not involved.
16	Miller.	1900	52	2 mos.	Palliative.	Vesicovaginal fistula established to secure drainage.	Died in 8 months from first examination.	?	Patient postponed operation for months, and when next seen growth was so extensive that nothing but palliative treatment was indicated.
17	A. Hemesse.	1904	52	1 yr.	Palliative.	.....	Died after 3 mos.		
18	Auvray.	1904	50	?	Surgical.	Excision.	Apparently cured.		
19	Brose.	1904	57	?	Surgical.	Complete excision of urethra.	Result not reported.	.....	Reported immediately after operation.
20	W. Knoll.	1905	68	6 mos.	Surgical.	Excision.	Apparently cured.		
21	Florence N. Boyd.	1906	51	6 mos.	Surgical.	Urethra excised.	Cure.	Columnar-celled carcinoma.	No recurrence 4½ years after operation.
22	D. C. Ball.	1907	55	?	Surgical.	Urethra excised to neck of bladder.	Recurrence six months later.	Squamous-celled carcinoma.	
23	D. C. Ball.	1907	57	?	Palliative.	.....	Died one year after first examination.	Squamous-celled carcinoma.	Cachexia marked.
24	Karaki.	1907	53	?	Surgical.	Complete excision of urethra.	Recurrence in the labia.	.....	Second operation was performed, but result not given.

MORTALITY AND LATE RESULTS FROM THYROIDECTOMY IN EXOPHTHALMIC GOITRE OR HYPERTHYROIDISM.

By C. H. MAYO, A.M., M.D.,
ROCHESTER, MINN.

THERE are many diseases named from some prominent feature or symptom, the specific germ of which has only been found within comparatively recent times. From our knowledge gained in laboratory findings, diseases of the various organs which have heretofore been merely described are finally placed upon a sure basis of cause and effect.

Hyperthyroidism, or exophthalmic goitre, has been held in a fog of superstition and dogmatic statement for a long period of time, its treatment as dependent upon chance as upon symptomatic indications, with no basis of facts in the laboratory findings until quite recently. Cures have occurred without treatment as well as with almost every possible type of treatment, accident, or disease.

We have in hyperthyroidism a certain definite condition, which shows in the gland so regularly that an experienced pathologist from an examination of the gland alone can give the symptoms and general condition of the patient from whom the gland was removed in 80 per cent. of cases.

Exophthalmic goitre is an especially bad term to employ, as a considerable percentage of cases may lack one or both of these conditions during a period of the disease. Hyperthyroidism is recommended as being a far more natural and descriptive term than Graves' disease, Basedow's disease, or exophthalmic goitre, for general use in describing the condition.

In our hospital work we find that the number of patients suffer-

ing from hyperthyroidism is greater in proportion to those with ordinary goitre than formerly. They are sent from a greater area of country, and do not represent a normal ratio in any particular locality. We have had over 300 such cases in 750 operations for goitre.

In the more serious cases thyroidectomy is now often preceded by a preliminary ligation of the superior thyroids, but this plan has not been followed with regularity for a sufficient period of time, so that these cases can be considered in this report.

Many patients will not recover good health, since the disease has been the cause of various terminal degenerations before operation was performed. A few suffer from hypothyroidism, or myxedema, with the result of destruction or loss of secreting epithelium. Operation will only relieve pressure symptoms.

While we have some remarkable cures of patients operated upon as long ago as fourteen years, the greater number of our operations have been made within the last four years, and the results in these cases have confirmed our belief in the efficacy of surgical procedures.

In the earlier results we had 50 per cent. cured within a few weeks, 25 per cent. cured within a few months, 25 per cent. improved but suffering from relapses of former symptoms. Some of these should have been operated upon for the removal of more gland, which we have done successfully several times.

The mortality from the early thyroidectomies represent more than should be properly surgical, because of the advanced condition of the trouble when the patients were referred to the surgeon. In over 300 operations, our mortality has been: 4 deaths in the first 16 cases, 3 in the next 30, 1 in 75, 2 in 75, and 4 in the last 134.

During the years 1905–06–07 we performed 200 operations for hyperthyroidism. Of this number, 22 were males and 178 females. Ten, or 5 per cent., of these cases died as a result of the operation. Letters were sent to the remaining 190, and answers received from 167.

Of these, 116, or 70 per cent., were cured; 32, or 19 per cent., improved; 10, or 5.8 per cent., slightly improved; 9, or 5.2 per cent., not improved.

DIVERTICULUM OF THE VERMIFORM APPENDIX, WITH REPORT OF A CASE.

By GEORGE BEN JOHNSTON, M.D.,
RICHMOND, VA.

THE following case of diverticulum of the vermiform appendix is reported because of its rarity. Prior to this time only twenty-five instances of this condition have been recorded. These cases are collected in a very recent article by Isabella C. Herb,[1] to which one may refer for an excellent *resume* of the subject as well as for the complete bibliography.

The patient was a woman, aged forty-two years, who presented every evidence of an acute attack of appendicitis, with pain, nausea and vomiting, and muscle rigidity. As she was not seen until after the forty-eighth hour of the attack, it was deemed advisable to postpone surgical intervention, if possible, until after the acute symptoms had subsided. This was accordingly done, and the patient was operated upon about ten days later, in July, 1907.

Operation disclosed a large, swollen, and much congested appendix, the base of which was particularly thickened and indurated. In addition, the wall of the cecum surrounding the base of the appendix was hard and indurated, so as to suggest malignant disease very strongly. For this reason this portion of the cecum was excised in one piece with the appendix and the opening in the intestine closed by suture. Recovery was uneventful, and the patient remains perfectly well at the present writing.

In view of the pathological findings, it is of interest to note that

[1] Diverticulum of the Vermiform Appendix. Jour. Amer. Med. Assoc., Chicago, 1907, vol. xlix, No. 26, pp. 2135 to 2137.

the patient's history was absolutely negative as to previous attacks of abdominal pain.

The tissues removed were promptly sent to Dr. Jos. C. Bloodgood, of the Johns Hopkins Hospital, Baltimore, to whom I am much indebted for the full pathological report and the accompanying photograph.

Diverticulum of appendix.

Gross Pathology. The alcohol specimen shows an appendix. The tip is surrounded by normal mesenteric fat, while the base toward the cecum is enlarged and irregular in outline. On section, the tip of the appendix is almost amputated from the remainder of the appendix. Between this and the base the wall of the appendix is chronically thickened with partial obliteration of the

lumen. The base of the appendix is the thickest portion of the organ; it is thrown into folds, and in one place shows a perforation. The tissue filling the lumen of the appendix and extending about the perforation is finely granular and hemorrhagic, but has not the distinct architecture of an adenocarcinoma. It suggests the picture of the so-called diverticulum of the appendix, in which the hypertrophied mucous membrane and glands follow the perforation, ramify through the chronic granulation tissue—chronic diverticulitis.

Microscopic Sections. Section 1: From the base of the appendix in which the wall is distinctly preserved. The section shows a thickened wall with lymphoid areas, increased vascularity beneath the peritoneum, with replacement of muscle by chronic inflammatory tissue. The mucous membrane is thrown into folds; in places the glands are slightly hypertrophied; there is an increase of the lymphoid tissue in the mucosa; in places this lymphoid tissue perforates the mucous membrane and extends to the surface. The epithelium lining the glands is everywhere intact; the normal architecture is preserved. In the stroma between the glands there is an excess of lymphoid cells.

Section 2: From the body of the appendix at some distance from the enlarged cecal end. This resembles Section 1, except the submucosa lymphoid hypertrophy is less marked.

Section 3: From the perforation or diverticulum. This tissue is composed of mixed lymphoid and fibrous tissue; we can trace the mucous membrane in the lumen of the appendix dipping down and lining the diverticulum. As the mucous membrane dips down it is associated with hypertrophy of the glands; beneath the glands there are large areas of lymphoid tissue which, in places, grow up, break through the mucous membrane, and extend to the lumen. In these places the glands show atrophy, with complete disappearance of some areas. In every gland the morphology and arrangement of the basal cells is preserved; there is no atypical growth and no downgrowth of these glands into the mucosa.

Section 4: Similar to Section 3. This section shows chiefly the mucous membrane lining the lumen of the appendix with the

thickened wall of the appendix beneath. In the connective tissue beneath the lumen the section passes through the diverticulum and is lined with mucous membrane. There is no evidence, therefore, of adenocarcinoma, but it can be looked upon as a beautiful example of diverticulum of the appendix.

NON-PARASITIC CYST OF THE SPLEEN: REPORT OF A CASE.

By GEORGE BEN JOHNSTON, M.D.,
RICHMOND, VA.

THREE kinds of cysts have been found in the spleen: (1) echinococcus cysts; (2) non-parasitic cysts—serous cysts, blood cysts, and lymph cysts; (3) dermoid cysts.

Echinococcus cysts, while the most common, occur only in those countries where hydatid disease prevails, and the spleen is rarely the only organ involved.

There is only one recorded instance of dermoid cyst of the spleen. This was reported by Andral in 1829, and was said to contain fatty matter like tallow, with hairs scattered throughout.

Non-parasitic cysts of the spleen are unilocular or multilocular in character, and contain either serous fluid, blood, or inspissated granular material. They are probably always hemorrhagic in origin, the most common cause being a partial rupture of the spleen following trauma, or occurring in the course of some acute infectious disease such as typhoid fever. Cysts of long standing usually show a distinct thick capsule, but it is questionable whether all of the reported cases should be classified as cysts, because in some of them the condition, as described, appears to be simply a subcapsular hematoma.

Non-parasitic cysts of the spleen are uncommon. In a paper read before this Association in 1905, Powers[1] collected 32 cases, including one of his own. In the same year, Bryan[2] reported a case before the American Medical Association and collected 35 cases from the literature. In a recent paper[3] on the subject of

splenectomy, which I read before the Johns Hopkins Medical Society, I was able to collect, up to January, 1908, 19 cases in which the spleen was extirpated for non-parasitic cysts. At the last meeting of this Association Huntington[4] presented a case which he treated by marsupialization, and I have found one other recent case which was discovered at autopsy and reported by Harnett.[5] A reference to these papers will furnish a complete bibliography on this subject. In this communication I simply desire to place one more case on record, together with a most complete pathological report of the specimen by Dr. William H. Welch, of the Johns Hopkins Hospital, Baltimore.

The patient was a woman, aged forty-six years, who had always lived in a malarial district, and who gave a history of several attacks of chills and fever. There was no history of severe trauma, by which the spleen may have been injured, nor could we elicit a definite history of typhoid fever. The patient complained of pain in the lower left abdomen. Examination showed a large myomatous uterus, but in addition a superficially placed mass in the region of the left kidney. This was about the size of a fist, rather freely movable, and slightly tender on pressure. Blood examination showed 6400 leukocytes, with polymorphonuclear neutrophiles, 52.5 per cent.; small mononuclears, 42 per cent.; large mononuclears and transitionals, 3.5 per cent.; and eosinophiles, 2 per cent. The urine was negative. It was determined to do a hysterectomy for fibroids, and at the same time to make an exploration of the mass in the left side. Seven years prior to this an operation was performed by Dr. Howard Kelly, of Baltimore, for suspension of the uterus.

Operation was done in April, 1907. This disclosed an ectopic spleen lying just above the left iliac fossa. This organ could be easily delivered through the median incision. On its concave surface, near the hilum, there was a prominent bulging mass about the size of a goose egg, perfectly white in color, and of a hard, rather brittle, consistency. The advisability of splenectomy was considered, but this was not done because the spleen appeared normal in every respect except for this mass and its increased

mobility, and because it was found that the cyst could be quite easily shelled out by blunt dissection. This was accordingly done, leaving a raw, bleeding surface, which was easily closed, however, by catgut sutures threaded on blunt liver needles. The repaired spleen was then replaced in approximately its normal position, but no attempt was made to secure it in place. The myomatous uterus was also removed. Recovery was without incident, and at the time of the patient's discharge the spleen could not be felt on palpation. I am much indebted to Dr. Welch for the following complete pathological report.

Gross Pathology. The specimen, preserved in alcohol, is an egg-shaped tumor attached to a thin piece of the spleen removed with the tumor. The tumor is 9 cm. long; at the broader, lower, or free pole 7 cm. in diameter; and at the smaller, upper, or attached pole 4 cm. in diameter. This latter pole, over a nearly circular area 4 cm. in diameter, is intimately adherent to the membrane-like plate of splenic tissue, about 0.5 mm. in thickness, which was removed with the tumor and which is intimately incorporated with the wall of the tumor and cannot be separated from it. This attached piece of spleen projects for a few millimeters free along its severed margin as a delicate, thin membrane. With the exception of the attachment to the spleen, the external surface of the tumor appears to be free from any evidences of adhesions, nor can bloodvessels be distinctly made out with the naked eye in the outer wall of the tumor, except a few small veins. This outer surface of the tumor is white or grayish white, and smooth save for slight irregularities or projections due to the extensive calcification of the wall.

Upon incision the tumor is found to be a single cyst with a thin wall not exceeding 0.5 to 1 mm. in thickness, except where attached to the spleen, the wall here being 2 to 2.5 mm. in thickness. The wall is rendered hard by extensive calcification, so that in places, especially at the lower pole, it is bony in consistence.

The sac of the tumor contains no fluid, but is filled with a solid material of a friable, grumous consistence in the central and greater part of the cavity, but smoother, more coherent, and of

elastic consistence near the wall of the cyst. The contents can be readily separated from the cyst wall, although somewhat adherent to it. Upon crushing the contents between the fingers there is more or less of a gritty consistence, but the prevailing consistence is rather soft and greasy. There is no such diffuse and extensive calcification of the contents as of the wall of the cyst.

The color of the material filling the cyst is dirty whitish, with a brownish tint, this latter tint being most marked in the periphery near the wall, where the color is yellowish brown, suggestive of altered blood pigment. In the central mass the color is little suggestive of altered blood. The contents of the cyst to the naked eye, therefore, appear to consist of debris of necrotic material with some altered blood, and fine particles of lime salts.

Microscopic Examination. Teased bits of the material within the sac show abundant crystals of cholesterin, fatty globules of small size, some myeline droplets, spherical, refractive bodies somewhat larger than leukocytes, and indeterminate granular and hyaline material. Intact cells or tissue cannot be recognized.

Microscopic sections through the wall and adjacent contents of the cyst, made after decalcification, show the wall to be composed of dense, laminated, fibrous tissue containing long, fusiform cells. In many places these cells are absent, the tissue being hyaline and necrotic. The calcification occurs throughout the wall in places, and is often continuous on the inner surface, which is not sharply defined, but consists of necrotic tissue, much infiltrated with blood, and continuous with the usually better preserved tissue in the outer layers.

In the sections the contents of the cyst appear for the most part as a structureless, granular, and homogeneous material rich in cholesterin, and devoid of intact cells, but near the cyst wall there are in places indications of a coarsely meshed trabecular connective tissue, necrotic, but containing in the meshes red corpuscles, fibrin, lymphoid cells, and larger blood-corpuscle-containing cells. This tissue is suggestive of splenic tissue, and appears at the lower pole as well as in other parts of the cyst.

Sections were made to determine, if possible, the precise relations

of the tumor to the spleen. The capsule of the spleen is continuous with the wall of the cyst. Where the wall of the cyst comes first into contact with the splenic capsule, this capsule bends down into the cyst wall. There is, however, a thick band of connective tissue separating the parenchyma of the spleen from the contents of the cyst and constituting in this situation the wall of the cyst. This connective tissue merges into necrotic and hyaline tissue, containing in slits and spaces red corpuscles, lymphoid cells, larger granular cells, and fibrillated fibrin, forming eventually debris in the interior of the cyst.

Diagnosis. The tumor is most plausibly interpreted as the result of an extravasation of blood of old date and associated with necrosis of tissue. There is no evidence of a genuine neoplasm. The source of the hemorrhage appears to have been the spleen, and its seat primarily beneath the capsule of the spleen, which, as described, constitutes the wall of the cyst either wholly or in part. It is possible that the hemorrhage is associated with an infarction, and that the contents of the cyst consist not only of extravasated and altered blood, but also of necrotic splenic tissue resulting from infarction; but positive evidence of such infarction is no longer present, and it may be that the condition was merely a hematoma distending the capsule of the spleen and perhaps rupturing it.

The question as to whether the tumor is due to primary rupture of the spleen with hemorrhage into the peritoneal cavity or to a subcapsular hematoma of the spleen it is difficult to answer positively from the existing microscopic appearances, but it is difficult to understand how such a non-adherent encapsulated cyst could be produced as the result of rupture of the spleen. I am, therefore, of the opinion that the tumor is the result of an intrasplenic hemorrhage or hematoma, causing a protusion over a circumscribed area of the capsule of the spleen. Changes have occurred in the blood and other contents of the tumor which indicate that the original lesion is of old date.

References.

1. C. A. Powers. Non-parasitic Cysts of the Spleen. Ann. Surg., Philadelphia, 1906, vol. xliii, No. 1, pp. 48 to 60.

2. W. A. Bryan. Cysts of the Spleen. Jour. Amer. Med. Assoc., Chicago, 1905, vol. xlv, No. 10, pp. 680 to 684.

3. G. B. Johnston. Splenectomy, with a Report of Six Cases, etc., Ann. Surg., Phila., vol. xlviii, No. 1, pp. 50 to 66.

4. T. W. Huntington. Report of a Case of Non-parasitic Cyst of the Spleen. Surg., Gynec., and Obstet., Chicago, 1907, vol. v, No. 1, pp. 31 to 33.

5. W. L. Harnett. A Case of Hemorrhagic Cyst of the Spleen. Lancet, London, 1907, vol. clxxii, No. 3, pp. 148 to 150.

SOME TECHNICAL POINTS IN THE CLEFT PALATE OPERATION.

By HARRY M. SHERMAN, A.M., M.D.,
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THERE are not a few unsettled, and therefore debatable, points in the surgical management of those cases of cleft palate in which the cleft is complete and extends through the alveolar process with single or double harelip. Some of these points are unquestionably major ones, and others may be classed as potentially minor ones; but of these latter it must be acknowledged that any minor point may assume major importance in any given case and count in a major way for or against the success of the surgical intervention. Therefore all points are practically major matters.

It seems to me that I have, for myself and for the present, at any rate, argued out and settled some of these points, and it is to get a wider discussion of them than I can any longer get with myself that I offer them here.

The first of the major points is the selection of the type of operation; the time at which the operation should be done is inseparably included in this.

It is with some shamefacedness that I confess that I have never tried the Brophy operation, although the plan has been credited with many almost incomparable successes. The reasons of my holding back are simple and several. I have rarely, if ever, found it an easy matter to bend, so that they would stay bent, or to break the bones of the little infant's face. It takes not a little force to break the alveolar process so as to push into proper alignment the

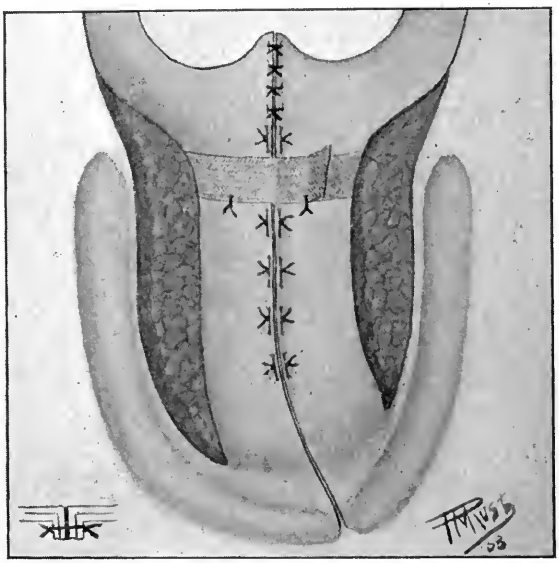
projecting intermaxillary bone, even after the palatal process and the vomer have been cut so that their parts may be made to overlap. Moreover, and here is the point, the elasticity of the unbroken tissue is constantly exerted to reproduce the deformity of position. Long ago, when I first began to attempt this work, I used to bend this part forcibly into place and then put in silkworm-gut sutures, through and through the bony plates, to hold the bent position. Under the elastic strain the sutures invariably cut their way out, and the effort was lost. Therefore, I have doubted that I could sufficiently forcibly press toward the middle plane the whole maxilla, when I had failed to so manage a part of it. If I could, in crushing the maxillæ together, *over*correct—as I can do in the treatment of a club foot—so that the retention wires and lead plates should have but a minor strain on them, I should be in a different mood about the procedure. But as I cannot overcorrect in the mouth, so as to extinguish the elastic tendency to the resumption of the deformed position, I have held back from the attempt. Mr. Edmund Owen, in writing of the Brophy plan, speaks lightly of the sloughs which form under the lead plates which hold against this elastic recoil of the maxillæ from the corrected position, while I have found that a slough in the mouth, where all toxin formed is absorbed or swallowed, is a dangerous thing in a little child. Still, I have been impressed with the arguments for the Brophy plan of approximating the maxillæ, and I tried to adapt the idea to a technique which should avoid the trauma of a brisement, or a slough, or the necessary upsetting of the plane of the bones which the Brophy plan includes. In the winter and spring of 1906 I had in the Children's Hospital, in San Francisco, five or six of these little babies, on one of whom I tried this: I got Dr. Leander Van Orden to make vulcanite plates, one to fit on each half of the separated maxillæ. Each vulcanite half had a metal stem which came out of the corner of the mouth and was fastened by a tape to a little cap on the head. This served to keep the plates in place so that their outer flanges fitted fairly firmly along the outer sides of the alveolar processes. Between the vulcanite halves were stretched little rubber bands, which tended to draw them together, and with

them the two maxillæ. The apparatus was intended to use the elastic bands to draw the maxillæ together, as dentists ordinarily use them to change the shape of the maxillæ or mandible in older children. The apparatus seemed to be well planned, it was most excellently made, but was a total failure, because it proved to be impossible to keep the vulcanite plates properly in place on the maxillæ. The lips, as the child cried, or the tongue could displace them, and it was impossible to keep tongue and lips quiet. Then on this child, and also on the others, I passed a rubber cord—a small rubber band—through the maxillæ, from side to side, above the palatal processes, just as Brophy does his silver wire. Along the outer side of each alveolar process strips of hard rubber, softened in hot water, were carefully moulded. Through perforations in these hard rubber plates the rubber cord was led, a perforated shot was clamped on one side, the cord there was tightened a little, and another shot was clamped on the other side to maintain the tension. This apparatus could not slip. I thought I adjusted each so that no trauma might occur, and I confidently expected that I could, in a few weeks and without any injury to the child, draw the maxillæ together in the middle line and preserve the normal plane of the bones. But the mucosa has not the resistance of the bone, and I invariably got sloughs under the hard rubber plates, no matter how little tension I put on the rubber bands. In one or two instances the rubber band, having been made too tight, cut downward through palatal and alveolar processes and let the apparatus fall into the mouth. *In every instance I got an infected mouth.*

Just at this time, when I could see only failure ahead, the earthquake came along. The apparatus had to be taken out of the mouth of each child under the treatment, for I could no longer take care of them. Some of these children we succeeded in getting back to their parents. Others died of gastro-intestinal disorders brought on by infected mouths and infected food, for we could get no milk and but little water, and could not boil the water we did get. The whole plan ended as a miserable failure, and I write it down now only to complete the story of the attempt, and to explain

why I personally shrink from the major act and traumatism of the Brophy plan.

I reverted now to the older operation, practically the Warren-Langenbeck operation, but I made some essential changes in important details. First, I kept the children out of the hospitals, or only let them go to the hospital for the operating room facilities, and made the mothers take them home immediately afterward.



Note the waxed tape caught by two stitches on its anterior edge. The muco-periosteal flap has been moved to the middle line and fastened to its mate by mattress stitches (see detail in the corner). The lateral incision is packed with iodoform gauze.

From that time on the mothers did the nursing, or employed trained nurses to do it in their homes. I did this because septic infection in the mouths had been the chief cause of the failures of permanent healing, and infection of the stitch holes in the palate had been the obvious reason of the cutting out of stitches. In the hospital the child's open wound was exposed, either in the ward or in a private room, to all the different strains of all the ordinary pyogens. Infection was inevitable. At home, even though

that home was a very poor one—and some of them, of course, were all of that—the child was exposed only to infections against which it had an inherited and also a developed immunity. The home environment was normal as against the abnormal hospital environment, and even if my explanation of the phenomenon is not the correct one, the fact remains that the children whom I took care of in all kinds of houses did better than those whom I had kept in the hospitals. Second, I selected a time for the operation which found the child sufficiently well nourished to stand the shock of the procedure and to permit it to lose a small amount of blood without danger. It is impossible to do this operation without the loss of some blood, but the amount may be minimized by a fairly skilful man who is patient and painstaking. Once or twice have I seen acute anemia, and I know now that those particular children—a four months' old infant, on whom I did the palate operation, and a six months' infant, on whom I broke the alveolar process to correct the projection of the intermaxillary bone and then repaired the harelip—were too young and too weak for the strain, though both survived it without special difficulty. But, not only must the child be well enough nourished to stand the strain, but it must also be well enough grown to offer proper tissues and a proper-sized mouth. The *little* baby's tissues are too delicate, the *little* baby's mouth is too small to work in satisfactorily. On the other hand, waiting for these conditions must not be pushed beyond a very definite limit. Without having made bacterioscopic tests to prove the fact, I am of the opinion that the advent of teeth increases the opportunity of infection in the child's mouth, inasmuch as it offers, in the wound of eruption and then around the crown of the tooth, abiding places for the ordinary mouth bacteria. Of course, delay beyond the period of infancy takes one into the time of adenoids and enlarged tonsils, and also of carious processes in the teeth. Finally, delay beyond the time at which the child learns to speak gives that child a bad tone and an imperfect articulation that are more difficult to correct after the palate has been repaired.

Therefore I would formulate this rule as regards the much

discussed proper time for the palate operation: Operate as early as the child can stand the operation and can offer you properly developed tissues in a mouth that is not too small for the moderately easy doing of the operation. Operate, if possible, before the child has any teeth, and surely, unless there are insurmountable objections, operate before the child learns to speak. In most cases this will place the operation on the palate somewhere between the sixth and ninth months of life. Finally, I have found this time early enough to satisfy all the requirements which have not been already specifically taken account of.

What has, up to this point, been said refers to the work on the hard palate—as that is the major matter in the management of the case. The question of the time for the operation on the lip must now come up, though in time of operation the lip must precede the palate. This is necessary in order to permit the alveolar process and the intermaxillary bone to be broken and put into proper alignment, and the repaired lip to be used to hold them in place. This operation must be done one or two months before the palate operation, even though it necessitates doing the palate operation through the smaller orifice of the repaired mouth. But at the most, only the posterior part of the palate operation can be done before the too prominent intermaxillary bone is put in proper alignment, and the association of this act with the repair of the lip is such, in my mind, that they must be done at the same time. Moreover, the pull of the repaired lip is quite rightly, I think, credited with narrowing the cleft of the palate, and this is a thing to be definitely desired in many instances. Therefore, for the very sake of getting a palate on which an adequate palate operation can be done, the malposition of the intermaxillary bone must be corrected and the operation upon the harelip must be done. In comparison with this consideration, the fact that the palate operation has to be done through the smaller opening of the repaired mouth is a mere matter of manipulative dexterity.

That this is one of the difficult operations to do I think we will all acknowledge, but up to the last year and a half it has been with me an operation much easier in the doing than in getting satis-

factory healing. My experience has been the common experience of all, and I have had to see many a good palate fall apart because the stitches tore out through the posterior half or two-thirds of the suture line. Primarily, too much tension, perhaps, and secondarily, stitch hole infection, surely, are the easily understood causes, but there was another cause which was active.

All the operators whose work I have seen and all writers who have described or pictured the suture have made it a plain, through and through, interrupted stitch. This brings together in the middle the thin edges of the cut mucosa and periosteum of each side and offers very little surface of contact for union; and even when union has taken place the healing line is so thin that it easily succumbs to the infection which is on both sides of it, in the nose and in the mouth.

In order to improve this detail, I have for the last two years been mattressing my sutures, and so getting broader surfaces of contact for the primary union. This has been a distinct advantage, and it has given me also, in the final result, greater thickness and strength in just the place where the old result was thin and weak. Still it is not an unmixed good, in the first instance, for it takes up more tissue than does the old way, and so puts more tension on the tissues in the bight of the stitches, but this objection I have learned to overcome, and so have eliminated the disadvantage. C. H. Mayo showed us how to put tape or a strand of gauze around both flaps, and through nose and mouth, to drain the nasal cavities and to fortify the stitches. In the use of this I found, however, that tape or gauze quickly became saturated with saliva and mucus and a veritable hotbed for the growth and dissemination of all infective mouth organisms. To obviate this and keep the tape—I did not try it with gauze—from fomenting infection, I saturated it with wax and iodine, using the formula suggested by James E. Moore as a substitute for the original Moorhooff bone wax. In doing the operation the sutures are put in place and tied, and I like to make a knot on each side of the suture line, so as to be sure to have a loose end to pick up when the time has come to remove the stitches. Then the end of a waxed tape is carried, by an

ordinary ligature carrier, around both flaps as far back as is the junction of the hard and soft palates. In this location, which is where the greatest strain will come and where the suture line first breaks down, it is caught at proper tension by a hemostat, and then by two or three sutures through the overlapped ends, after which the hemostat is removed. In this place the tape plays the part of a relaxing suture and the mattress sutures are coaptation stitches, and the combination is most satisfactory. For the mattress sutures I invariably use silkworm gut in the palate and horsehair in the uvula; they and the waxed tape are immaculately clean, and in a clean mouth all tell for primary union, and the rule is to get primary union from end to end of the suture line. The tape stays in place seven or eight days, the silkworm gut four or six days longer. The firmness of the line of union is shown by the turned down edges of the flaps, which may make a little antero-posterior ridge along the centre of the palate.

I usually pack into the lateral releasing incisions some 5 per cent. iodoform gauze; the first packing is permitted to stay two or three days, after which it is changed daily. This I do myself. The gauze serves as a splint or support for the flaps, separates the mouth from the nose, and the iodoform seems to control saprophytic action. At any rate, it is a cleanly device, and does not permit too early union of the lateral releasing incisions with coincident increase of the pull on the silkworm-gut sutures.

Since I have been using this combination of the mattress stitch, which stays in place twelve to fourteen days, the waxed tape, which is untouched seven to eight days, and the iodoform gauze packing, changed each day, I have been able to dispense with all but the simplest plans of cleaning the mouth. I have the mother or nurse spray the mouth and nose with simple salt solution after each feeding, and salt solution I prefer to any of the favorite formulæ of the nose and throat practitioners. I wish to wash away only an excess of normal mucus, not the thick dry mucus of an old inflamed mucosa. In the infant's mouth the Dobell's solution type of application leaves the mucosa bare, it seems to me, and so stimulates some hypersecretion. The simple salt solution is less irritating and much to be preferred.

The method of feeding is a minor point with a major value. To expect a child to swallow comfortably with catgut and waxed tape in the roof of the mouth is expecting a great deal, and even if they could, there would be not a little unswallowed residue left in the mouth, around the stitches and tape, as breeding places for mouth organisms. To avoid this I used to withhold food by the mouth for a few days, feeding by the rectum instead, but I quickly found that this was an incompetent method, for the child could not get enough food to enable it to undertake the extensive reparative processes necessary to mend the palate. Lately I have been feeding these children by the catheter through the nose, and it works most admirably. The children are necessarily bottle fed, and after the operation I have poured into their stomachs, by funnel and catheter, the usual amount of their customary formula or milk mixture, and at the usual feeding intervals. The children, even those who are old enough to at first protest, quickly learn to accept the innovation, and I can, therefore, get in a proper amount of suitable food without its invading or soiling the mouth. Surely slipping a sterile catheter, annointed with sterile vaseline, through the nose is a cleaner act than spoon feeding milk into a mouth where are extensive wounds, and, in addition to its cleanliness, it avoids all, or almost all, strain upon the sutures, for the strain made by crying is nothing to the strain caused by the act of swallowing. And I have often seen these infants stop their crying as soon as the catheter was in place and the food began to reach the stomach, while the children who have to swallow their food have necessarily continuous successive pulls upon the stitches until the meal is ended. There is one danger: it is very easy to overfeed, for the child cannot say when it has had enough. Therefore it is important to gauge the amount poured in by the catheter by the amount the child had been in the habit of taking before the operation, and not increasing this amount, except by the smallest proportion, unless the child very plainly indicates, by crying for food before the proper interval has elapsed, that it has not had enough at the last feeding.

To summarize: Operate upon the palate as soon as the child

is old enough to stand the shock of the operation and the loss of a little blood, and has sufficiently developed tissues to hold sutures and not too small a mouth.

Operate, if possible, before the eruption of teeth, and surely before the child begins to speak.

Suture the mucoperiosteal flaps with silkworm-gut mattress sutures, the uvula with horsehair. Put a tape, saturated with an iodized wax, around both flaps as a relaxing suture. Let it surround the flaps at the point where the hard and soft palates join. Pack the lateral incisions with iodoform gauze.

Operate upon the harelip about two months before you do the operation on the palate, and at the time of the harelip operation cut the vomer and the palatal process and break the alveolar process at the proper place to permit the pressing of the projecting intermaxillary bone into alignment so as to make the curve of the alveolar process symmetrical.

After both the harelip operation and the operation on the palate feed the child by means of a funnel and a catheter passed through the nose. Be careful, in this method, to give not too much, but just enough. Cleanse the mouth and the nose with simple salt solution spray after each feeding.

HEMOLYTIC TESTS FOR CANCER.

By GEORGE W. CRILE, M.D.,
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For purpose of control, 107 individuals in good health were subjected to hemolytic tests, in none of whom was any hemolysis elicited. Fifty individuals, the subjects of miscellaneous diseases, were experimented upon; in four instances hemolysis was elicited. These four included one case of hemoglobinuria, one of eclampsia, one of hematuria, and one gastric case—diagnosis not made. Fifty cases of carcinoma were tested, of which 39 presented hemolysis; 16 cases of sarcoma, of which 13 hemolyzed; making a total of 66 cases of malignancy, of which 53 hemolyzed.

Of cases of carcinoma recurrence, or cures, to prove if cured, ten tests were made, of which nine gave no hemolysis; one questionable. Of two cases of papilloma, one hemolyzed; one, no hemolysis. Of eleven cases of surgical tuberculosis, nine gave hemolysis. Of ten cases of chronic suppuration, none hemolyzed.

Of the 13 cases of malignant disease which did not give hemolytic reaction, one was a gastric case, diagnosis not proved; one an advanced case of sarcoma of the spine; one an advanced case of presumed sarcoma; one an advanced case of recurrent carcinoma; five were advanced cases of carcinoma of the breast; two were advanced cases of epithelioma of the neck; one an advanced case of lymphosarcoma; and one a case of cystic ovary.

In 14 cases of suspected malignancy that were subjected to the test, in one hemolysis was elicited. In all these latter, positive diagnosis of non-malignant disease was arrived at; of these, two were gastric cases; four, gall-bladder cases; two, tumors of the

thigh; one, breast case (cyst); one, tumor of the chin; one, tumor of the clavicle; one, cystic ovary; two, cirrhosis of the liver.

As an example of the value of the method was a case seen in the medical service of the hospital, March 18, 1908, which showed hemolysis and reverse hemolysis, in consequence of which a tentative diagnosis of carcinoma of the stomach was made, a diagnosis of anemia having previously been made by the physician in charge. One month later, after palpation, a specimen of tissue from the stomach was obtained, from which an absolute diagnosis of carcinoma of the stomach was made.

EDEMA OF THE LARGE INTESTINE, WITH LOCALIZED NECROSIS OF ITS WALL, FOLLOWING SPLENECTOMY IN BANTI'S DISEASE.

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OMAHA, NEB.

The subject of this report was referred to me by Dr. W. F. Milroy from the Medical Service of the Douglas County Hospital, Omaha, and in making this reference the following was submitted:

History. John K., aged twenty-one years, American; height, five feet eight inches; weight, 156 pounds; occupation, cook; entered the hospital December 1, 1906. His family history was negative. For two or three months each spring, from the time he was a young child until his thirteenth year, he suffered from diarrhea, being well the remainder of each year. When thirteen years old he was in bed four months with diarrhea. Eight or ten times during this attack he passed a little blood mixed with mucus. After this illness there were similar ones of mild character, becoming less severe each summer. This trouble has not recurred since 1903.

In 1902 the patient had his body severely squeezed between two cars, and immediately vomited about a teacupful of blood. There was no other blood passed at that time.

In the spring of 1905 he was very sick for two weeks with malaria. In the fall the malaria recurred twice, but was controlled by quinine. Later, having discovered a tumor in his abdomen, he was told by a physician that this was his spleen.

At about 8 P.M., August 5, 1906, the patient fell, his abdomen striking heavily across the edge of a board. He felt sick and

faint, and went to bed. He had a good night, and felt well next morning. At breakfast he was nauseated and began to vomit blood. The first was dark and clotted; afterward it was bright red. A small amount of blood was also passed from the bowel. He was put to bed, where he remained two weeks. On November 30, while standing in the street, he discovered blood running from his bowel. The quantity was estimated at eight ounces. There was no vomiting; the next stool contained blood.

Physical Examination. Lungs normal. A well-marked and widely distributed mitral systolic murmur with strongly accentuated pulmonic second sound was present. Left border of the heart nearly one inch to the left of the mid-clavicular line, and the right border one inch to the right of the right sternal line. Liver apparently about normal in size. Tenderness in the left hypochondriac region. The spleen reaches from the seventh rib to within two finger breadths of the level of the umbilicus and as far as the left parasternal line. There was a moderate amount of ascites, but no other dropsy.

Urinary Examination. Negative.

Diagnosis. Trauma, cancer, peptic ulcer, and decompensated valvular lesion are readily eliminated. Although the malarial organism has not been found in repeated blood examinations, it can hardly be doubted that the patient has had that disease. However, the first hemorrhage occurred three years before the patient contracted malaria. The exsanguinating hemorrhage of August 5, 1906, took place when the patient was in the best of health, and ascites is not caused by malaria under conditions like the present.

Tuberculous peritonitis is suggested by the history of the prolonged intestinal trouble and ascites. The following considerations negative this theory: (1) The good general nutrition of the patient; (2) the healthy condition of the lungs; (3) the patient recovered from the diarrheal trouble; (4) he has no fever; (5) peritoneal exudate, if inflammatory, has a specific gravity of 1018 or more, and contains albumin, 4.5 per cent. or more. If not inflammatory, it has a specific gravity of 1015 or less, and contains albumin, 2.5 per cent. or less. Sixty ounces of fluid were with-

drawn from the patient's abdomen. It had a specific gravity of 1009, and contained albumin, 0.08 per cent.

"Splenic anemia," so called, is scarcely regarded as a pathological entity. It is an obscure condition about which we know little. In this disease the spleen is greatly enlarged, firm, smooth, and commonly tender. The enlargement is usually progressive. There is no other glandular enlargement. There is progressive dyspnea and muscular weakness very much as in pernicious anemia. Hemorrhages from the gastro-intestinal tract, repeated at intervals, are characteristic. Between these attacks the health may be good. When the disease has existed for a long while the liver may show a secondary cirrhosis. This is the condition known as "Banti's disease." Hemorrhage often occurs before any change has taken place in the liver, and is due, apparently, to mechanical obstruction of the venous circulation of the stomach in those areas which are drained by the splenic vein. Ascites may be present.

The following report by Dr. Bliss indicates the condition of the blood at the first examination after the patient entered the hospital:

Blood examination of J. K., Douglas County Hospital: Red blood corpuscles, 2,120,000; white blood corpuscles, 4000; hemoglobin content, 40 per cent.; color index, 1 minus; polymorphonuclears, 70 per cent.; small lymphocytes, 23 per cent.; large lymphocytes, 4 per cent.; large mononuclears, none; transition cells, 2 per cent.; eosinophiles, 1 per cent.; some poikilocytosis; no nucleated reds; no plasmodia malariæ.

Dr. Milroy, in summing up his examination, was rather inclined to the theory that we had to deal with a cirrhosis of the liver with malaria rather than to the theory of a splenic anemia with malaria.

My own impression was that, a pernicious anemia having been excluded, it was rather splitting hairs in giving a name to the pathology, its nearest symptom complex corresponding, in my opinion, to "Banti's disease;" it filled to the letter Senator's definition of "Banti's disease," viz., "Splenic anemia with ascites, without local evidence of a general and otherwise positive tuberculosis." Urobilin was not found in the urine—this is important when positive, but it does not negative the diagnosis of Banti's disease.

Medical treatment having failed, and as the man was suffering from pain and despondency, I recommended splenectomy, which was accepted and carried out February 28, 1907. The operation was difficult because of adhesions, and there was considerable hemorrhage. The pedicle was secured in separate catgut ligatures. The liver was smaller and paler than commonly observed during operations upon other viscera; the intestines appeared normal. Shock was extreme, and active, painstaking measures were demanded to overcome it. These efforts included hypodermoclysis, hot salt solution enemas, strychnine hypodermically, etc. The patient reacted and was progressing fairly favorably, when, on the morning of the eighth day following the operation, there developed the usual symptoms of an acute inflammatory intra-abdominal lesion in the right lower quadrant, and I operated upon the man the same night for a supposed acute perforative appendicitis—the symptoms seemed classical. Upon opening the abdomen through the usual incision of the right rectus muscle, the diagnosis of appendicitis was proved a mistake. Instead, the following conditions were presented: There was a large amount of bad-smelling, turbulent fluid in the abdominal cavity. The sigmoid flexure had become displaced to the right and fixed; besides, it was very edematous. On its right mesenteric border there was a dime-sized perforation through which a thin, feculent discharge was escaping, and in addition there were two sphacelated spots distal to the perforation, about the size of a nickel each, which were about to perforate. The perforation and the necrotic spots were on the same line extending for three inches parallel to the mesenteric border and about one-half inch distant from it. Because of the edematous condition of the bowel it was impossible to make a secure invagination of the necrotic line, and tension causing the stitches to tear out. The technique employed was to fold in the necrotic line as well as possible by means of a double buttonhole stitch, and then tack an omental flap over the area involved. Thececum and its appendage were in the same edematous condition as was the sigmoid, and the rectus was so edematous that it practically filled the pelvis. None of the small intestine was

observed. After thorough irrigation, the lower peritoneal cavity was sponged as dry as possible and local and pelvic tubular drainage established. The edema of the lower sigmoid and rectum was so great that difficulty was encountered in introducing the rubber drainage tube between it and the empty bladder into the pelvis. The man was placed in Fowler's position. To the astonishment of all interested, the relief of the intra-abdominal tension following the incision and the establishment of drainage stopped the gangrenous process in the sigmoid and admitted of repair to the extent of preventing further intestinal leakage into the peritoneal cavity. A fecal fistula formed. The postoperative history shows that for days and weeks the man's life was in jeopardy because of a persistent diarrhea and our inability to nourish him. Gradually, however, improvement began, and today he is able to get about, walk down town, and is gaining in weight. Occasionally there is a discharge from a knitting-needle-sized fistula, which I have not thought it prudent to operate upon. In addition to the giving of tonics, he has taken the extracts of spleen and bone marrow. Last fall (after a visit to Dr. Crile) I filled the patient's bloodvessels with good healthy blood by direct transfusion. The transfusion operation was apparently not of any particular benefit.

The case I have outlined represents typically a thrombosis of the splenic vein, the thrombus occluding to a lesser degree the superior and to a greater degree the inferior mesenteric veins, the arteries not being occluded. Moist gangrene of the sigmoid resulting. It is without doubt somewhat analagous to the case reported by Delatour in his paper entitled "Thrombosis of the Mesenteric Veins as a Cause of Death after Splenectomy," published in *Annals of Surgery*, 1895. His patient died from thrombosis of the superior mesenteric vessels, and a thrombus was also found in the splenic vein. A rotation of the spleen upon its axis had occurred before the operation, and, besides, Delatour questions whether or not the ligation of the pedicle *en masse* may not have had something to do with the formation of the thrombus in the splenic vein and its extension into the superior mesenteric vein—the nearer the ligature the firmer the clot was found to be. Edens, in the

Mitteilungen aus den Grenzgebieten der Medizin und Chirurgie, Achzenter Band, Heft 1, 1907, reports a case of thrombosis in the splenic veins in a fatal case of a symptomatic Banti's disease. The splenic vein was very tortuous, the lumen widened, and in many branches were found fresh and older thrombotic masses. Microscopically, a section of the spleen showed marked dilatation of the splenic vessels, in many places the elastic tissue of the arterial wall being entirely broken through and thrombi being forced into the spleen pulp. In all branches of the splenic vein Edens found evidence of an endophlebitis, and concluded that the thrombus formation outside of the spleen was due to changes within the spleen itself. On the other hand, a section of the spleen from my case shows marked thickening of the fibrous capsule and considerably more stroma than normal in the trabeculæ. Other than a slight degeneration of the lymphoid cells of the pulp and a disintegration of the blood corpuscles in various areas, the spleen pulp is normal. There is no change in the bloodvessels other than a slight thickening of the arterial walls, and I find no evidence of either arterial or venous thrombosis.

These findings of the condition of the splenic bloodvessels proves conclusively that the postoperative thrombosis of the splenic vein can hardly be considered from another standpoint than due to the traumatism of the splenectomy. In a study of the causes of death following splenectomy we find many cases reported as from peritonitis, and although I have no positive evidence in support of the theory that in some of these the peritonitis may have resulted from a thrombosis of the mesenteric vein secondary to a thrombosis of the splenic vein, yet when we consider Delatour's case and my own, its occasional occurrence must be conceded.

The famous case of Elliott, reported in *Annals of Surgery,* 1895, in which he resected successfully forty inches of the small bowel for thrombosis of the superior mesenteric artery, has never been free from the suspicion that its origin was traumatic.

The writings of Broca and Schnitzler upon immediate and early enterorrhagias, those of Ullman upon late hemorrhages, and of Kukula upon the complexity of the causes of both types are

well known, and all are really based upon the experimental work of Litten.

In the case just reported the thrombosis was evidently traumatic, and possibly, with more gentleness in the handling of the pedicle, preventable; just as I believe most cases of postoperative gastric and intestinal hemorrhages are due to either venous or retrograde arterial thrombosis, and result from the trauma of the operation. A localized arteriosclerosis of the gastric or intestinal bloodvessels has been demonstrated. In such subjects, and in those suffering from endocarditis, a thrombosis with hemorrhage and a possible perforation can come about independent of the trauma of an operation.

An exhaustive study of the literature of splenectomy by those in a position to carry out this research for me has failed to find reported a single case of edema with gangrene of the *large intestine* following splenectomy. And I do not recall ever reading of gangrene of the *large* intestine resulting from a thrombosis of the superior mesenteric artery or vein—it has always been the small bowel. From the favorable termination of my case it would, therefore, appear as before stated, that the thrombosis must have been limited to the splenic vein, and occluded in part only the mouths of both the superior and inferior mesenteric veins, chiefly the latter.

PSYCHICAL END-RESULTS FOLLOWING MAJOR SURGICAL OPERATIONS.

By JAMES G. MUMFORD, M.D.,

ASSISTED BY

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Said John Hunter to a patient with an obstinate running sore who was brought to him in consultation, "And so, sir, you have an obstinate running sore."

"Yes, Mr. Hunter."

"Then, sir, if I had your obstinate running sore, I should say, 'Mr. Sore, you may run and be damned.' "

A patient of my own, two years convalescent from a fractured patella, lived in a condition of fancied pain, in despondency and worry lest he should never be able to resume his vocation as a mounted policeman. The seriously flippant suggestion that he lock his worry in a bureau drawer, and mount his horse daily, restored him to the force in less than a fortnight.

Last year Dr. Vander Veer reminded us of worry as an interesting and possible etiological factor in the development of breast cancer.

Such anecdotes and conceptions are familiar to us all: and the experienced surgeon of reflective temperament doubtless considers always the psychical elements in his cases; but I doubt if we are aware always how deeply significant those elements may be in controlling the return to health of a surgical patient. Rather are we wont to accept the patient from the hands of his physician; to shrug perhaps at what we are pleased to call his neurotic state;

to proceed with the operation if the obvious lesion warrants it; then, with an anatomical cure established, to shift the case back upon the weary physician for the tedious struggle back to health.

I do not maintain that we should refuse to operate upon such discouraging cases. On the contrary, I believe, as Dr. White long ago taught, that such operations—the operation *per se*—do great good, and are important therapeutic agents. My thesis is that we should appreciate clearly the types of individuals liable to suffer from postoperative psychic disturbances, and the surprisingly large number of such persons; that we should perform the operations, of intelligent purpose; and most of all, that we should recognize our ability to aid in the after-treatment, and should bear our share of its responsibility.

With such thoughts in mind I have made a careful systematic study of a large group of general hospital patients, who were operated upon between seven and nine years ago. The task has been laborious and at times discouraging. Allow me a word about the character, scope, and method of the investigation.

I undertook to select 500 consecutive mutilating operations of expediency, excluding all emergency cases, such as those of acute appendicitis and extra-uterine gestation; all traumatic cases and cases of malignant disease; cases of plastic surgery, such as hernias and perineorrhaphies; and such cases of chronic appendicitis as were not giving rise to mild symptoms, at least, at the time of the operation—500 cases of major operations. But how shall we define a major operation? The Century Dictionary tells us it is an operation involving some danger to life. What operation does not involve some danger to life? The term is as hard to define as is the term gentleman. We all think we know the breed, and we let it go at that. I sent for the patients and corresponded with them. As one would expect, a majority did not respond, but I was enabled to study satisfactorily 129. Nearly all of these 129 were usually intelligent persons, belonging to our best class of hospital patients; and they furnish figures sufficient on which to base just conclusions. I believe I undertook my task with an open mind—certainly with no intention to prove an hypothesis.

Certain of my figures are interesting, though the rehearsal of figures is always somewhat dreary. There are 91 women in the list of correspondents, and 38 men only; for men in hospitals are more commonly the victims of trauma than are women. Further, under the limitations of my search I found that a large majority of both men and women in my completed list had been operated on for lesions of the generative organs—68 of the 91 women, 23 of the 38 men. The remaining 38 patients had suffered from such miscellaneous disorders as gallstones, chronic appendicitis, benign tumor, goitre, loose cartilage in the knee-joint, joint tuberculosis, renal tuberculosis, and so on through a long list.

As for the persons afflicted with diseased sexual organs (and I include the female breast in this group of organs), of the 68 women, the diagnoses were:

TABLE I.

Ovarian tumor	22
Uterine myoma	19
Salpingitis	11
Fibrous tumor of breast	7
Cystic tumor of breast	6
Menorrhagia necessitating hysterectomy	1
Hydrosalpinx	1
Procidentia	1
Total	68

Of the 23 men with diseased sexual organs, the diagnoses were:

TABLE II.

Varicocele	8
Hydrocele	7
Tuberculous testis	5
Hypertrophy of prostate	2
Benign tumor of scrotum	1
Total	23

With such figures before us, few as these figures are, we must consider the significance of certain clinical terms. What is the meaning of the words *cure*, *anatomical cure*, *psychical result?* I take it that a cure is the important end of all therapeutic endeavor;

a perfect cure is the *summum bonum;* but is it not true that a large proportion of our cures are relative only? The man with a disabling recurrent appendicitis is absolutely cured of all pain and digestive distress through the removal of his appendix; the man with gangrene of the foot is relatively cured by an amputation, though he be left maimed and halting. The woman with an ovarian cyst enjoys an anatomical cure when the tumor has been excised and the wound has healed kindly and soundly, though an unessential organ has been removed. All these are clinical cures; are cures from the surgeon's point of view; but just here there enters into the problem an element of wide-reaching metaphysical significance. The ills of life, like all the so-called facts of life, are in direct relation, and are proportionate, to our experiences. The man who has just lost his appendix, if he lack poise and clear vision, feels that he has been through a grievous crisis, that he has suffered a great cruelty in the operation, that the sanctity of his vitals has been violated, and that he can never again be what he was. Many persons hold that view, I find.

The man who has lost his foot may find little comfort in his freedom from pain and impending death. His old life is gone. He must readjust himself to new circumstances of existence. His relations to his environment must be recast. He must limp, a cripple, through the remainder of his life, bearing with him an unsightly stump and a grievous scar to fret and distress him.

The woman whose ovary was removed, useless though that ovary may have been, believes herself to have been unsexed; she has heard tales of changes in temperament; of coarsening features; of mannish tendencies. Or, perhaps, she thinks a full set of ovaries essential to sound health and the bearing of womanly cares. She looks forward to some mysterious ill-defined change in herself or to invalidism; and the reassuring farewell words of the surgeon fail to turn her from the expected melancholy course. Strong character and optimism are needed to overcome these tendencies of environment and condition, unless aid be brought from outside sources.

How then shall we define a *cure?* I protest that a cure consists

only in returning a man to that state of physical and mental health which shall enable him to live his life, to accomplish his wonted work, to adapt himself to his environment in vigor of body and freedom from pain; with his normal functions undisturbed, with his mind unclouded, buoyant, assertive. That is the perfect cure, but it is a cure not easy of attainment. A more common and reasonable condition of cure is a state of relative comfort and efficiency; with little pain and distress; with infrequent anxiety; with renewed if imperfect confidence in the bodily powers.

By the term *anatomical cure* we imply a sound wound-healing and a restoration of the bodily functions so far as such restoration may be compatible with the loss or damage to members and organs.

Psychical results are related to the subjective mind. Their bearing upon the cure concerns the patient not in proportion to anatomical perfection, nor to potential physical and intellectual capacity, but rather to what he himself feels to be his perfection or capacity; and just in so far as his objective intelligence is feeble or has become enfeebled, just so far is he fated on the one hand to remain a wreck, or on the other hand to refit his shattered being. We must teach ourselves to look to the ultimate prognosis. It is not what we are; it is what we think ourselves to be. That is the sum total of the old argument.

Such conceptions lead us to a fair and just estimate of the results of surgery; and with such conceptions in mind we study with renewed interest the story of a large and important group of surgical patients, bearing in mind also a constant endeavor, in estimating psychical end-results, to distinguish actual anatomical failures from failures due to the fact of operation in itself, to the patient's mental distress that an operation was performed, to his skepticism, to his belief that it aggravated the disorder, to fear that another operation may impend.

There were, then, 38 men in our completed list. We shall consider first the men, and then the women. Of the 38 operations, 7, or 18 per cent., were unsuccessful in the end—shall we call them failures? All of these failures were *psychical* failures, and all of the operations were on the genital organs—for varicocele, for

hydrocele, for tumor of the scrotum. These seven patients were young men, apparently vigorous. They tell us that they "feel worse than ever." They complain of "pain, weakness, and feeling miserable and good for nothing," there is "loss of will power," and that they are "weaker than before." There were 23 operations of this genital class, so we find that 30 per cent. of such operations on the genitalia may result in failures.[1]

Such a finding may not surprise surgeons, but if a further analysis and consideration of the figures represent truly the average of general hospital results, we see that late psychical disturbances after operations on men are rare, and may be disregarded in our prognoses, *except* in the case of these operations on the genitalia; and that after operations on the genitalia of men we must expect persistent neurotic or psychic distress in a third of our cases.

May not these considerations induce us to amend, or to alter, the common assertion that psychical disturbances occur in the despised class of neurotics only? The unfortunate final invalids of my list, before operation, were no more feeble mentally and physically than were their fellows. After operation 30 per cent. of the genital victims developed psychical ailments, while no other men on the list developed such ailments. Must we not conjecture, if we may not assert, that there is some factor inherent in these genital cases which makes for subsequent nervous disturbances in all except the firmly balanced men? It will be objected, of course, that many men with slight anatomical lesions of the genitals seek operation for the sake of some fancied benefit, and that they are correspondingly disturbed mentally by the lack of any subsequent conspicuous anatomical improvement. Here is an interesting fact: No one of those men who were failures psychically suffered the loss of organs. Their distended veins were removed, their vaginal tunics were excised, but their testes and other essential organs were not disturbed. Shall we assume, as we seem justified in doing, that the very presence of those intact generative organs, associated with the fact of an operation, and the fear that, though sexual powers

[1] I am aware that these figures are significant merely. They are too few to justify broad conclusions.

were not lost, still there remained the possibility of such loss—shall we assume that this complex of circumstances and ideas have united to make wretched these lives? The merchant who sits in his office expecting bankruptcy is an unhappy, unnerved wretch. The same merchant revives his drooping spirits and retricks his beams after the blow has fallen. And singularly enough, our studies of the hospital list show us—as a comparison with the psychic wrecks—that an equal number of men who have actually lost important organs, testes and prostates—that these men have no psychical disturbances, whether or not they are anatomically cured. They have lost their testes and their prostates, and they may suffer from tuberculous sinuses and incontinence of urine, but they are reasonably cheerful, vigorous, and useful men.

The significant observation regarding the men in our list, therefore, is that those suffer especially from psychic disturbances who are left with sound functionating sexual organs, but are living in dread that the enjoyment of those organs some day may be lost to them. If this observation be true, it brings us back directly to the second great fundamental fact of all life: the attitude of the sexes toward each other, and the obligation of procreation. These are elemental conceptions, outgrown by those rare individuals only whose intellectual development may have taught them completely to subordinate the physical to the intellectual part of their being.

The women in our list furnish us with a problem somewhat similar to that of the men, but represented in larger and more complex figures. I have said that of the 91 women, 68 were operated upon for some lesion of the sexual organs, and that these operations were mutilating. If we accept our previous definition of cures, we find that 34 of these 91 operations were in some sort failures; but that 5 only were *anatomical* failures, while 32 were *psychical* failures. In other terms, 40 per cent. of the operations were failures, but 35 per cent. of this 40 per cent. were psychical failures. And bear in mind that all of these cases of psychical failure are recorded "well" at the time of their discharge from the hospital. Let us examine the cases of sexual and of non-sexual mutilation among these women: Sixty-eight of the 91 women are

in the sexual list, and 23 in the non-sexual list. Of the 68 in the sexual list, 25 are failures; but 24 of these are psychical failures. Of the 23 in the non-sexual list, 8 are failures; and of these 8, 6 are psychical failures. We remember that in our list of men there were no non-sexual failures. Perhaps these confusing figures will be more obvious if we reduce them to percentages:

TABLE III.—STATISTICS OF WOMEN.

Total number of operations	91	
Total number of failures	37.4	per cent.
Total psychical failures	35	per cent.
Total operations on sexual organs	68	
Total failures in operations on sexual organs	37	
Psychical failures in operations on sexual organs	35	per cent.
Total operations on non-sexual organs	23	
Total failures in non-sexual list	35	per cent.
Psychical failures in non-sexual list	26	per cent.

Thrown into general terms, this table means that while three-fourths of the operations in women were on the sexual organs, both sexual and non-sexual operations showed a nearly equal percentage of failures; and that in both sets of operations the psychical failures far outnumber the anatomical failures, and further, women appear to be poor psychical risks after all operations, but somewhat worse after sexual than after non-sexual operations.

Let us inquire further as to the various subordinate types of those operations which have been followed by psychical disturbances, early or late:

TABLE IV.—GYNECOLOGICAL OPERATIONS.

	Total.	Total failures.	Psychical failures.	Psych. failures. Per cent.
Ovarian cysts	22	8	8	36.4
Myomata uteri	19	8	8	42.1
Salpingitis	11	6	5	45.5
Fibromata of breast	7	2	2	28.6
Cysts	6	1	1	16.8

Our cases not included in the table above are too few in each class to afford instructive figures, but the results of the totals are those I have given in Table III. As for the classes in Table IV, no one class is particularly striking, but in general terms it appears

that mutilating operations on the uterus and annexa give a worse showing psychically than do operations for non-malignant breast tumors. One asks, perhaps, on what do we base our conclusions that these patients are psychic failures? On the following circumstances: The patients are recorded as anatomically "well" on leaving the hospital, and they have been asked the following questions eight years later: (1) How long had you been suffering before your operation? and how? (2) Could you work? (3) When did you get back your strength after the operation? (4) How long after leaving the hospital before you could do your regular work? (5) Did the operation cure you completely? (6) Are you glad you had the operation? (7) Have you had any return of the old trouble? (8) Have you had any bad symptoms due to the operation? (9) Do you worry about yourself? (10) If so, why?

My conclusion that certain patients regard themselves as still unsound is founded on a careful record of their complaints. Their replies are all quite similar, and are variations of such phrases as, "I am very weak, and have had no relief;" "I am greatly debilitated;" "I have been a wreck for five years;" "I have the old pain, and am very nervous and weak;" "I have never been strong; am weak, nervous, tired, and easily confused;" "I have poor endurance, and am more weary than before," etc., etc., through columns of similar writing.

So much for the surface value of these studies; and in this brief paper I have been able to touch on a few phases only of our elaborate figures. If I were to leave the matter here, however, I should be giving a grossly false and pessimistic impression of the advantage of surgical operations from the patient's point of view. Nearly all of my correspondents—the most pronounced psychical wrecks even—assert that they are glad the operation was done. The persons with anatomical failures are those who regret the operation. The persons with psychical failures are feebly complacent because, as they say constantly, their physician has told them that the choice lay between operation and death, or a worse invalidism.

Another and important factor in this investigation is the personal equation of the investigator. I endeavored to meet this difficulty by maintaining an unbiassed attitude and by associating with myself a critical assistant who had no special previous interest in the matter. Nevertheless, I admit that other surgeons might read other interpretations into the answers we received.

I believe there is a further and striking observation to be made in connection with these studies; and an important lesson to be drawn, which should influence our practice.

Private practice will show no such large percentage of psychical failures as hospital practice shows. I say this without the figures of private practice at hand; but eighteen years of experience in such practice, and the careful following of all private surgical cases convince me that what is now an impression merely would be proved a fact.

The reason for this assumed divergence in the results of general hospital and private practice does not depend upon the types of patients. If the type of patient determined psychical results, I believe the failures in private operating would be greater than in hospital operating. The reason for the divergence is that the personal influence of the surgeon is allowed to count constantly for good in the case of private patients. This is no time for a dissertation on psychotherapy, but all men who are in any way alive to the experience and teaching of recent years must recognize the significance of the healer's personal influence, by whatever special name that healer may be called.

The patient goes, or is sent, to a surgeon because that surgeon is assumed to be a person specially qualified to treat that patient. The relationship thus established is or should be one of assured confidence on the part of the patient. As a rule, and while this relationship is maintained, the progress of the patient is good. Delay in progress and the development of psychical symptoms appear after the immediate relationship is severed. Almost instinctively we recognize, or should recognize, this fact in the case of our private patients; and we keep them under more or less constant observation until health is restored. Later, if trouble

develops, or bad symptoms recur, such patients return to the surgeon, often for encouragement or reassurance only; and the benefit secured appears constantly and notoriously to be out of all proportion to the advice such patients receive. For such special advice to the special patient, and for the special ailment, the surgeon must be more effective than the patient's family physician even, though with that physician the surgeon must be in constant and cordial correspondence. By such means only shall the surgeon bear his share of the responsibility and realize properly the ultimate prognosis.

But the hospital patient—how shall he share in these benefits? I confess the problem seems almost impossible of solution, as our great city clinics are constituted. Some little is now being done, perhaps, through such social visiting movements as have been attended by an interesting success of late at the Massachusetts General Hospital. Neurotic patients are visited by trained persons at their homes and working places. Their home life, the circumstances of their work, their worries, difficulties, and mental states are investigated; and they are given intelligently a sense of being guided and supported toward better things. The busy surgeon cannot undertake such tasks, but he may avail himself of expert assistance in these lines, and may see occasionally the worst of the cases which are reported to him. In desultory fashion I have myself tried this plan, and am satisfied that it has brought back some discouraging cases to a cheerful and useful life. It is an old story that we specialists are in danger of drifting away from the proper function of a physician—the restoring of health as well as the saving of life. I believe that in the nature of our work we cannot with propriety act as pure material scientists only—as mere investigators, experimenters, and operators. With a little added thought, and with the proper machinery of assistants and subordinate workers, we should be able to eliminate largely the considerable number of psychical failures and invalids who trace their pains to the surgeon's incomplete endeavors.

FRACTURE OF THE FEMUR.

EXTENSION MADE FROM TRACTION BELOW THE KNEE OF THE INJURED LIMB AND COUNTEREXTENSION THROUGH A SIMILAR POSITION FROM THE IMMOBILIZED UNINJURED LIMB.

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The treatment of fractures was probably among the first accidents to demand sympathy and skill in the human race; and with this sympathy and skill constantly and universally in demand through all the centuries that have passed it is hardly to be supposed that any new principle will ever be evolved. The most brilliant and modern of all—the open method—while it possesses all the advantages of exactitude and precision, is hardly likely, even with the assurance of absolute safety, ever to become the accepted method even in hospitals where its advantages can be most readily attained.

One of the first and most obvious demands in fracture of the thigh bone is a provision for continuous and prolonged recumbency, and for this purpose fracture beds have been contrived. These beds have engrossed the attention and elicited the combined inventive genius of the lay and the professional minds until they supply almost every conceivable want and add greatly to the ease of nursing and comfort of the patient, and yet, strange as it may seem, there is scarcely a hospital in Christendom that has a fracture bed. There are many good reasons for the surgeon's aversion to fracture beds, but there are equally cogent reasons why they should be used;

and it would not surprise the writer to see them resume their place as a necessary adjunct to the surgeon's requirements.

In fractures of the femur attention must always be directed to three untoward tendencies, viz., to rotation, angulation, and shortening, three serious defects, any one of which, if pronounced, is attended with crippling results, and for the correction of which scores of ingenious apparatus have been devised, but each in turn to be found untrustworthy and disappointing. Of the three tendencies to deformity, that of shortening has given the most trouble and has elicited the greatest skill. While the various appliances are legion, all the methods of extension can be arranged under two heads. In the first the two fragments are treated by different parts of the same apparatus; in the other an element is introduced wholly independent of the apparatus.

Under the first head I may mention the long splint, the upper end of which was attached to the trunk by means of straps, bandages, and perineal bands, to provide for counterextension, while the extension was obtained by drawing down the parts connected with the lower fragment and securing them to the lower end of the splint. This simple device was elaborated by the attachment to the upper part of a bent iron shoulder piece (Hodge's extension) and by a foot piece with adjustable slot and graduating screws; but the fact that it must necessarily extend beyond the feet, and therefore was impracticable under ordinary circumstances, has driven this most admirable contrivance out of existence.

The principle aimed at in the use of the long splint was afterward attained by the use of plaster of Paris. This was applied to the trunk and pelvis with a view to provide for counterextension, and then during extension was continued down the thigh, covering in the entire extremity. This had the advantage of compactness and simplicity, but experience soon developed the fact that the *counterextension* was irksome, called for so many points of relief, and the final results revealed such a degree of disappointment, that the ardor of its early advocates was dampened and this mode of treatment left to only a few, who still feel that it offers the best means at our disposal for dealing with this formidable accident.

To overcome the tendency to angular deformity the double inclined plane was devised. Upon this instrument was lavished all the skill of the mechanician, but the final verdict was that no better results were attained than by simpler devices, and this theoretically perfect instrument was relegated to unmerited obscurity. It is still described by authors, and very properly so, not as a recommendation for others to follow, but as a warning against any who may be disposed to invent a new contrivance.

Of the second variety, the method of Bucks, in which *gravity*, through pulley and weight attached by means of adhesive plaster to the parts below the seat of fracture, is relied upon to overcome the contraction of the muscles, is the simplest, has enjoyed the greatest popularity, and is still extensively employed in many of our largest hospitals.

So far as results are concerned, there is really little choice in methods. Within a couple of weeks from the reception of the accident the pain at the seat of the injury measurably abates, and from this time on the restlessness of the patient may defeat the efforts of the most skilful surgeon with the most perfectly devised apparatus. One of the most common and glaring abuses of Bucks' extension is the sliding down in the bed until the patient's foot rests against the foot of the bed. To avoid this tendency to slip downward the surgeon elevates the foot of the bed, but the final result shows that the best efforts and the wisest theories may all be thwarted by unruly and ungovernable patients.

In my treatment of fractures of the thigh bone I have for many years been in the habit, in selected cases, of making the sound limb act as a splint and a means of counterextension to the injured one. I first began the practice in young children. Having first carefully wrapped the entire sound limb in protective, it was afterward enveloped in plaster of Paris. A similar course was pursued with the injured limb, except that the plaster of Paris did not extend above the knee. The plaster was now permitted to set and get perfectly hard, after which extension was made, and when the two feet were in symmetrical positions a plaster bandage was made to incorporate both feet and legs. With such a simple

dressing I have had no further trouble until it was removed, and in some instances with no ascertainable defects. The reason for putting each limb in plaster separately, and letting the plaster

FIG. 1

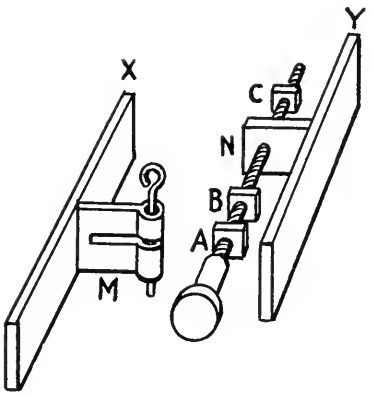

FIG. 2

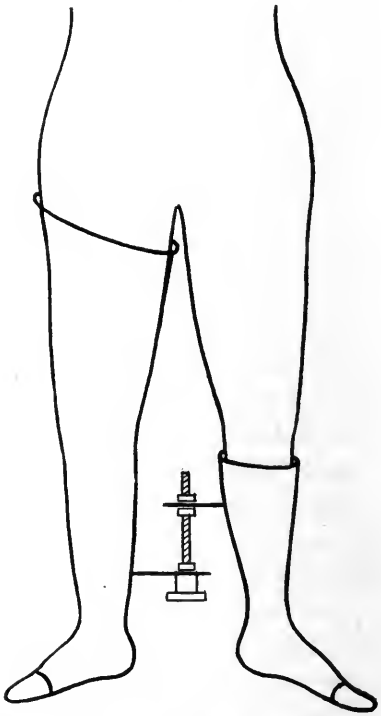

FIG. 1.—*X Y*, parallel plates made of iron one-eighth inch thick, three inches wide, and six inches long. The attached pieces *M N* are about three inches long. The left (*M*) has a slot and pin to permit of junction after each has been applied separately. The nuts *A B C* are for tightening after the requisite extension and rotation have been attained. (See Fig. 2.)

FIG. 2.—The apparatus has been incorporated by plaster of Paris with the plaster casts. The inequalities of the limbs have been overcome and the nuts tightened.

harden before binding them together, is that after the first has fully hardened there is no danger of applying the final bandage so tightly as to make pressure sores possible.

In applying such a dressing to an adult I have found the muscular resistance, even under ether, to be considerable, and in one instance so much force was required that the plaster cast upon the injured limb shifted its position and resulted in a pressure sore.

To obviate the necessity of administering an anesthetic, or depending upon an assistant to make extension, I have employed an apparatus illustrated in Figs. 1 and 2. The traction is so gradual, firm, and irresistible that the patient hardly experiences any pain, while the satisfaction of comparison as the extension is being made is very great. Should there be any change in the relation of the casts and a slight shortening take place, a few turns of the connecting bolt will rectify it. This apparatus is not confining; it will not prevent the patient from getting down in bed and resting his feet against the footboard, but both feet and both extremities must move in parallel lines, and this change of posture will not affect the symmetry of the limbs. With this apparatus I have attained union without perceptible shortening, in a fracture of the femur partly within and partly without the capsule, that immediately after the accident showed an inch and a half of shortening. As a simple, inexpensive, and effective appliance for treating fractures of the femur I cannot too strongly urge it upon those whose patients are at a distance and cannot be seen daily.

One point in the dressing that I have regarded with special favor is that, while the extension and rotation are provided for in the bolt and nuts, the apparatus does not conceal the injured limb, hence any angulation laterally, or any tendency to forward projection of the lower end of the upper fragment, can be readily detected as the swelling subsides, and minimized, if not entirely corrected, by additional measures. This means of traction and fixation will be found most advantageous as a preliminary step to nailing or screwing the fragments together in non-union of intracapsular cases.

A REVIEW OF CASES ILLUSTRATING CERTAIN PHASES OF RENAL INFECTIONS AND NEPHROLITHIASIS.

By CHARLES H. FRAZIER, M.D.,
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The series from which these cases are selected represents varied conditions, including nephrolithiasis, such inflammatory lesions as perinephritis, pyonephrosis, pyelitis, tuberculosis, parenchymatous nephritis, nephralgia, movable kidneys, traumatic lesions, and tumors, including hypernephroma. Of the three fatal cases, two patients died of uremia, one after a decapsulation for parenchymatous nephritis, the other after a nephrectomy for pyonephrosis. In the third fatal case death was due evidently to reflex postoperative ileus.

From the series I have selected a few cases illustrating certain phases, some of them more or less unusual, of nephric infections and nephrolithiasis.

Case I.—*A patient with advanced phthisis suddenly develops a lesion apparently intraperitoneal and of an inflammatory nature, but proving to be an enormous perirenal hemorrhage, probably secondary to a cortical tubercular process.*

History. Index File No. 2505. Patient, male, aged twenty-seven years. Referred to the Surgical Clinic at the University Hospital on May 29, 1907, by Dr. B. F. Stahl.

The chief complaint at the time of his admission was pain in the right side of the abdomen and great tenderness. The patient was married, but had no children. Father died of bronchitis. One brother and sister living and well. Two of the family died of

measles in childhood. Patient had always been fairly strong and well, but had the usual diseases of childhood, including measles, chickenpox, scarlet fever. He had not had typhoid or pneumonia. About two years ago he had several severe hemorrhages of the lungs, but had no apparent trouble since then.

Present Condition. Six weeks ago patient had an attack of a pain similar to the present one, coming on suddenly and associated with vomiting. The pain extended up to the lowest rib and radiated toward the lumbar region, but not toward the genitalia. He has had some frequency and some pain on micturition, but no hematuria. On the afternoon of his admission he began to have an attack similar to that just described, in which the pain was referred chiefly to the right lumbar region.

Physical Examination. The whole of the right side of the abdomen was excessively rigid and tender, the greatest point of tenderness being posteriorly about one inch from the spinal column and about four inches above the crest of the ilium. There was another point of tenderness anteriorly in the region of the gall-bladder. The patient complained of some pain on drawing up the knees, and the respiration is more costal than abdominal. Peristalsis was present, though not very active.

Urinalysis. Urine cloudy; acid reaction; specific gravity 1016; heavy trace of albumin; numerous leukocytes and crystals; no tubercle bacilli.

Examination of the Blood. White blood corpuscles, 32,000; red blood corpuscles, 4,480,000; hemoglobin, 55 per cent.; differential count, polymorphonuclear, 91 per cent.; lymphocytes, 4 per cent.; large lymphocytes, 5 per cent.

COMMENTS. Perhaps the only significant feature of his previous history was the fact that he had had phthisis for at least two years. For a few days prior to his admission to the hospital he had been suffering more or less pain in the right lumbar and also in the region of the gall-bladder. The pain became so intense that just before his admission to the Hospital he had been given a hypodermic of morphine by his physician. When I first saw the patient, about two hours later, I found him lying in bed with legs drawn up and evi-

dently in great pain. A hasty examination revealed at once very decided rigidity of the right abdominal and lumbar muscles, tenderness universal but exquisite both at Mayo Robson's point and about one inch from the vertebral column posteriorly, and although the muscles were so rigid that deep palpation was unsatisfactory, I thought I could feel a tumor by bimanual palpation. His leukocytes numbered 30,000. His pulse was 96 and temperature 102° F. From the physical examination there seemed little doubt but that we were dealing with an acute inflammatory intraperitoneal lesion originating probably in the gall-bladder; at least, a provisional diagnosis of cholecystitis had been made, although the possibility of an appendicitis with the appendix postcecal and pointing toward the liver was considered. Owing to the extensive tubercular lesion in his lung, it was decided not to operate at once, but the next morning, his condition being worse, exploration seemed the safest course. Through an exploratory incision in the right rectus muscle it was discovered at once that the lesion was extraperitoneal. The first wound was closed and another incision made as for a lumbar nephrotomy. Once the false capsule was opened, there was found a large hematoma under great tension. The blood was for the most part clotted, and represented in bulk between one and two pints. A histological examination revealed nothing in the specimen removed other than blood, some partly organized, the rest the result of a more recent hemorrhage. The collection was entirely removed and a tampon of gauze introduced to control some active bleeding, occasioned by the operation, and the wound partially closed. He recovered from the operation, and for two months the patient had a typical hectic temperature with marked exacerbations, but suddenly and without apparent cause his temperature returned to normal and remained there. His condition so improved that we were able to have him transferred to the White Haven Sanatorium. He has since recovered sufficiently to enable him to resume his business in Philadelphia.

As to the association of renal with pulmonary tuberculosis, Walsh[1] found that 63 per cent. of patients who had died from pul-

[1] Annual Reports of the Henry Phipps Institute, 1904–05, vol. ii.

monary tuberculosis had demonstrable tubercular lesions of the kidney. In a number of instances, representing one-third of the total number, evidences of young tubercles were found just beneath the fibrous investment. The prevalence of cortical lesions in renal tuberculosis suggests a possible source of hemorrhage in the case just reported. In the absence of the least suggestion of trauma it is difficult to account for the bleeding in any way other than to attribute it to the breaking down of a superficial tubercular process. To recapitulate: A young man with advanced phthisis without premonitory signs suddenly develops a lesion apparently intraperitoneal and inflammatory in origin, but proving to be a perirenal hemorrhage probably secondary to a cortical tubercular process.

CASE II.—*Bilateral and multiple nephrolithiasis; trauma suggested as a causative factor; unilateral nephrolithotomy with recovery of two large branched and four smaller calculi; development of an intercurrent facial erysipelas which proved fatal.*

History. J. D. K., File No. 3793; was admitted to the University Hospital March 9, 1908, having been referred to me by Dr. Ewing, of West Grove, Pa.

The patient was a painter by occupation, married, and had six children, three having died in infancy. He had been given to the use of tobacco and alcohol in excess. He had the usual diseases of childhood and two attacks of what was believed to be lead colic.

Present Illness. About five years ago he began to have sudden attacks of pain in the left hypochondriac region, running down into the left groin and left testis. The pain was accompanied by frequency and occasionally urgency of micturition. During the last year he had pain referred to the glans penis and occasional tenesmus. About six months ago the patient noticed for the first time a small quantity of blood in the urine. During the last two years he has been laid up in bed by attacks similar to those above described, the last attack, ten days ago, confining him to the house for a week. During the last year he has lost about twenty pounds.

Physical Examination. Arteries not especially sclerotic; pulse regular; considerable emaciation; no jaundice; no arcus senilis.

No lead line in gums, though some reddening at the alveolar margins. Thorax is flat and markedly emphysematous. Hyperresonance anteriorly obscuring cardiac dulness. The heart sounds are strong, the aortic sounds being greatly accentuated. Breath sounds faint especially on the right side. No rales. The liver dulness extends from the lower border of the sixth rib to three-fourths of an inch below the margin of the ribs in the right parasternal line. Kidneys and spleen are not palpable.

Urinalysis. Specific gravity 1012; acid reaction cloudy, and whitish sediment; large quantity of pus, but no casts.

Analysis of Blood. Red corpuscles, 4,710,000; white corpuscles, 6900; hemoglobin, 70 per cent.

Radiograph shows multiple calculi on both sides.

Cystoscopic examination unsuccessful because of cloudy medium.

COMMENTS. In this case we were dealing with a middle aged man, of intemperate habits, presenting symptoms of nephrolithiasis of some five years duration. Prior to that the patient had been kicked in the back by a horse, and it would seem as though this injury may have been an influential factor. Israel says that subcutaneous trauma is in all probability a responsible factor in the etiology of renal calculi, although it has never been so proved. A clump of necrotic cells or a blood coagulum resulting from the injury may form the nucleus for the stone.

It is more than likely that in the majority of cases the stone existed before the injury, and that the sudden dislodgement of the stone incident to the trauma brings on the first attack of renal colic. A skiagraphic study of the patient in question revealed bilateral and multiple calculi. The radiograph revealed two large calculi in either kidney, as well as a number of smaller ones. An attempt was made to catheterize the ureters, but the media was so beclouded by pus and blood that the attempt was abandoned. While the indications for operation were sufficiently clear, it was thought that the same information might be derived from a segregation of the urine, which would influence us in deciding which kidney should be attacked first. It would not have been advisable to have operated upon both at one sitting,

and we had decided to operate upon the kidney which displayed the lower functional activity. As to functional renal diagnosis, I insist, in every case coming to my clinic for operation, that the functional activity if possible of each kidney shall have been determined. In all cases a daily estimation of the total quantity and the specific gravity of each specimen as voided is recorded.

The latter method, though seemingly inexact, gives us an insight into the condition of the kidneys entirely disproportionate to its seeming crudity. Unless there is some contra-indication, the urine from each kidney is collected by ureteral catheterization and carefully examined. The methylin blue and phloridzin tests have given us a more satisfactory index of renal efficiency than cryoscopy.

A nephrolithotomy was performed on the right side; the kidney, which was at least a third larger than the average, was delivered without the wound and an incision made from one pole to the other, exposing the pelvis and calculus. Two large branched calculi (see figure) and four small ones were removed and the wound in the kidney closed with interrupted catgut sutures, a small opening being left at either end for through-and-through drainage. The patient developed during his convalescence facial erysipelas, which proved fatal.

Generally speaking, the oblique is I think to be preferred to the vertical incision, as giving the best exposure and facilitating the deliverance of the kidney from the wound. For purposes of drainage, as in perinephritic abscess and for pyonephrosis, the vertical incision will suffice, having an advantage over the oblique incision in that it takes into consideration the direction of the muscle fibers, corresponding in this respect to the McBurney operation for appendectomy. For the control of hemorrhage when a free incision into the cortex is required digital compression of the renal artery is so eminently satisfactory that clamping of the vessels is unnecessary. The latter method exposes the structure to a greater degree of trauma, and one which might result in thrombosis of the vessels, particularly the vein, or in damage to the nervous mechanism of the kidney; and, if the ureter is included,

interferes with the introduction of a sound for purposes of exploration. Next to digital compression, preference should be given to Israel's plan; the vessels are isolated, a small rubber drainage tube is passed around them, and by making traction upon the ends of the tube the circulation is interrupted. The two important features of operation for the removal of stone are the deliverance

Illustration showing the relative position of calculi.

of the kidney and a liberal opening into the calices or pelvis. Through a small incision there is danger of breaking the stone into fragments and of leaving one or more behind which may serve as the nucleus for subsequent stone formation. Liberal exposure of either pole of the kidney is all the more important when we take into consideration how frequently there are more than one calculus. Multiple calculi are almost as frequent as the solitary variety, and

the involvement of both kidneys has been variously estimated at from 25 to 50 per cent. Infection of the perirenal fat should be guarded against by walling off with pads as carefully as one would when operating in the presence of infection within the abdominal cavity.

CASES III, IV, V, VI.—*Idiopathic perinephritis, so-called; operation in three of four cases revealed a positive gross lesion, furnishing evidence in favor of a pathological basis for all cases of so-called idiopathic nephralgia.*

One of the most difficult problems with which we are confronted in the diagnosis of renal affections is the distinction between the nephralgia, the renal colic, and hematuria attendant upon a calculus, a twisted pedicle, or a movable kidney, and the same symptom complex, in which none of those conditions are present. Representing the latter condition are at least four of the cases in this series, of which three were operated upon. For purposes of illustration, it will suffice to allude only to the essential features of each.

CASE III.—One of those (case of T. W. C., reported by Dr. James Tyson, "Perinephritis as a Cause of Symptoms Simulating those of Stone in the Kidneys," *University of Pennsylvania Medical Bulletin*, November, 1906) was a young man aged twenty-three years, of excessively nervous temperament. He had attacks of renal colic on the right side, and a year before he came under my observation he had been operated upon by his then attending surgeon. At the operation the kidney was surrounded by dense adhesions and was drawn toward the median line and firmly against the under surface of the right lobe of the liver. The kidney was decapsulated and explored for stone, with negative result. Relief was afforded, but only temporarily; the attacks returned in four weeks and became so severe that the patient became addicted to the morphine habit. He was in this condition when I saw him, and exhaustive examination failed to reveal the presence of stone or any lesions which seemed to call for a second operation.

CASE IV.—A second case (No. 3119), a woman, aged forty-six years, of hysterical temperament, had had attacks of renal colic

first on the right, then on the left side. While under my observation the kidneys were not palpable, the urine examination was negative, and repeated skiagraphic plates failed to reveal stone. Operation was proposed, but not acceded to.

CASE V.—The third case (No. 2044), a young lady, aged twenty-two years, had had three attacks of renal colic on the right side. The kidney was easily palpated and tender on pressure. At the operation the kidney was found to be distinctly larger than, perhaps twice as large as, it should be, situated almost entirely below the twelfth rib, surrounded by the densest adhesions, suggesting the preëxistence of an active inflammation, and absolutely immovable. It was thought at the time that the symptoms could easily be accounted for by the macroscopic findings, and after freeing the adhesions no further exploration was made. A year and a half later the patient passed a small oval-shaped calculus, but I am still inclined to believe that in this case the nephrolithiasis was of secondary rather than of primary origin.

CASE VI.—The fourth case (No. 2090), referred to me by Dr. James Tyson, presented a typical history of renal calculus. The nature of the paroxysms and the hematuria were at least suggestive. We found at the operation no evidence of stone. The kidney was lobulated, and near the upper pole seemed to be undergoing cystic changes.

COMMENTS. To recapitulate, we have four cases presenting the clinical picture of nephrolithiasis, of which, in the three coming to operation definite gross lesions were found suggestive of an inflammatory reaction at least of the capsule if not of the kidney itself. The etiology of the symptoms complex has been the subject of much debate, and many theories have been advanced to explain them, but the more numerous the observations on the operating table, the stronger the evidence in favor of what might be called pathological nephralgia as against the so-called idiopathic type. In every case of my series there was a positive pathological basis, just as in every one of the fourteen cases from Israel's clinic some anomaly of the kidney was found. Leaving out of consideration those cases which are due to calculus, to hydronephrosis, tumor, tubercu-

losis, and other well-known causes, it would seem as though many of the remainder should be attributed to a perinephritis, a condition the pathology and nature of which are now well recognized. Many contributions, notably that of Rayer, have emphasized the distinction between perinephritis and paranephritis: perinephritis, an inflammation of the fibrous investment of the capsule, which may extend to and involve the cortex (often primary), leading to thickening and adhesions to the renal parenchyma, and only occasionally to subcapsular suppuration; paranephritis or epinephritis, on the other hand, implying an inflammation of the fatty capsule frequently secondary and usually terminating in abscess formation.

To turn now from perinephritis, I wish to present another type of renal infection, a rather unusual case, complicating pregnancy.

CASE VII.—*Pyelonephrosis with complete disintegration of the kidney in the third month of pregnancy; duration of illness only three weeks; no suggestion in history or findings of renal infection; complete nephrectomy and uterectomy; recovery from operation and uneventful gestation.*

History. Case No. 2948. Married woman, aged thirty-one years, admitted to the University Hospital November 6, 1907, having been referred to me by Dr. W. W. Stein, of Shenandoah, Pa.

Patient had been married two years. One child was born sixteen months ago. She is now in the third month of her second pregnancy. Of the family history, one sister was reported to have been operated upon for cervical adenitis. The rest of the family are unusually well, there being no history of cardiac, renal, or pulmonary disease. The patient had had diphtheria and usual diseases of childhood, but apart from these had always enjoyed excellent health until November 20, 1907. About three months ago she was awakened during the night by a pain in the left side of her abdomen, especially marked in the lumbar region, accompanied by tenderness both anteriorly and posteriorly. The pain was severe enough to double the patient up. Immediately after the onset of the attack she vomited a greenish material, and the nausea and vomiting continued for a week. On the fourth day of the attack the pain first radiated to the groin and genitalia, but at no time have there been any urinary disturbances. Since her admission to the hospital

there has been no severe pain, only a dull ache in the lumbar region. She has a sensation of dragging and weight if she turns on the right side.

Physical Examination. Patient is a woman, aged thirty years, robust; tongue clean; complexion pallid; expression composed; examination of lungs negative; the heart is normal in outline; there are no murmurs, but the pulmonary second sound is somewhat accentuated. Examination of the abdomen: a movable tumor is easily palpated, moving slightly downward on inspiration; somewhat tender on palpation and extending within an inch of the middle line of the abdomen. Tumor can be easily felt by bimanual palpation.

Urinalysis. Specific gravity 1020, acid reaction, slight flocculent sediment, and trace of albumin. On microscopic examination, mucus and crystals of oxalate of calcium. There are no more than one to two leukocytes to the field. Cystoscopic examination by Dr. B. A. Thomas. The left ureteral opening is round and abnormal in appearance. The right ureteral opening is normal, as is also the bladder wall. No urine at all could be evacuated from a catheter introduced into the orifice of the left ureter.

Blood Analysis. Red corpuscles, 450,000; white corpuscles, 11,200; hemoglobin, 51 per cent.; differential count, polymorphonuclears, 74 per cent.; lymphocytes, 14 per cent.; large mononuclear leukocytes, 8 per cent.; transitional cells, 1.5 per cent.; eosinophiles, 2 per cent.; basophiles, 0.5 per cent.

Briefly, then, we were dealing with a patient who, three weeks prior to admission to the private pavilion of the University Hospital, had an attack of sudden onset characterized by excessive pain, especially in the left lumbar region, reaching to the groin and genitalia and associated with vomiting. This attack was the first and last she had. Meantime she had complained of a dull ache in her side, but of nothing else. When I first saw her she was in the second or third month of her second pregnancy; there was to be felt by bimanual palpation in the lumbar region a movable cystic swelling, not especially painful on pressure, about the size of a child's head. It was thought to be a hydronephrotic kidney; cystoscopic examination showed that there was no urine being

ejected from the left ureter, the bladder wall was normal in appearance, there was no pus or blood in the urine, the total quantity voided the day after admission was 38 ounces, the temperature was normal, there had been no chills, and the leukocytes numbered 11,000. After much deliberation, operation was decided upon, and, much to our surprise, we found a kidney the seat of an advanced pyelonephrosis; in fact, a pus sac with only a remnant of kidney substance. What remained of the kidney and four inches of the ureter were removed. Convalescence was uninterrupted, and the patient has passed through the pregnant period without any untoward effects or even knowledge of the removal of the affected kidney.

It was not until 1892 that the exact relation between the pathogenesis of pyelonephrosis and the pregnant state was established (Reblaud reported 5 cases). Prior to that attention had been called to the fact that, in pregnant women, one or both ureters, usually the right, were dilated, and it remained only to demonstrate the relation between the retention of urine and infection of the kidneys and ureters, for which we are indebted chiefly to the French school, to complete the chain of evidence. In the majority of cases hitherto recorded this complication did not manifest itself until after the fifth or sixth month of pregnancy, when by virtue of its increased size the gravid uterus would exert more pressure than in its earlier months.

Whether to interrupt gestation or to operate in these cases is a delicate and difficult question to decide. In the milder cases, when the ureter is not completely blocked, conservative measures are clearly indicated. When drainage is absolutely interrupted, and the patient suffering from systemic infection, the relative dangers of a nephrotomy or interrupted gestation must be weighed in the balance.

The striking feature of the case I have just referred to was the apparently short duration of the disease (three weeks), the absence of the slightest suggestion, either in the history or in the clinical and laboratory findings, of the presence of an advanced renal infection, and the development of this complication at a comparatively early stage of the pregnant period.

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APPENDIX.

FELLOWS OF THE AMERICAN SURGICAL ASSOCIATION.

1880–1908.

FOUNDER.

SAMUEL DAVID GROSS, M.D., LL.D., D.C.L. Oxon., LL.D. Cantab., LL.D. Edin.

OFFICERS.

Presidents.

ELECTED

1880. Samuel David Gross, M.D., LL.D., D.C.L. Oxon., LL.D. Cantab., LL.D. Edin.
1883. Edward Mott Moore, M.D., LL.D.
1884. William Thompson Briggs, M.D.
1885. Moses Gunn, A.M., M.D., LL.D.
1886. Hunter McGuire, M.D., LL.D.
1887. D. Hayes Agnew, M.D., LL.D.
1888. David Williams Cheever, M.D.
1889. David W. Yandell, M.D.
1890. Claudius Henry Mastin, M.D., LL.D.
1891. Phineas Sanborn Conner, M.D., LL.D.
1892. Nicholas Senn, M.D.
1893. James Ewing Mears, A.M., M.D., LL.D.
1894. Frederic S. Dennis, M.D.
1895. Louis McLane Tiffany, A.M. Cantab., M.D.
1896. John Collins Warren, M.D., LL.D., Hon. F.R.C.S. Eng.
1897. Theodore P. Prewitt, M.D.
1898. William W. Keen, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1899. Robert F. Weir, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.

ELECTED

1900. Roswell Park, M.D.
1901. De Forest Willard, M.D.
1902. Maurice H. Richardson, M.D.
1903. Nathaniel P. Dandridge, M.D.
1904. George Ben Johnston, M.D.
1905. Albert Vander Veer, M.D.
1906. Dudley P. Allen, M.D.
1907. William H. Carmalt, M.D.
1908. C. B. G. de Nancrède, M.D.

Vice-Presidents.

1880. Louis Alexander Dugas, M.D., LL.D.
1880. James Rushmore Wood, M.D., LL.D.
1882. Edward Mott Moore, M.D., LL.D.
1882. Moses Gunn, A.M., M.D., LL.D.
1883. William Wirt Dawson, M.D.
1883. Claudius Henry Mastin, M.D., LL.D.
1884. Joseph Chrisman Hutchison, M.D., LL.D.
1884. Elisha H. Gregory, M.D., LL.D.
1885. Christopher Johnston, M.D.
1885. Thomas P. Russell, M.D.
1886. T. F. Prewitt, M.D.
1886. J. W. S. Gouley, M.D.
1887. Nicholas Senn, M.D., Ph.D., LL.D.
1887. Frederic Shepard Dennis, M.D.
1888. T. G. Richardson, M.D.
1888. John B. Roberts, M.D.
1889. Claudius Henry Mastin, M.D., LL.D.
1889. C. B. G. de Nancrède, A.M., M.D.
1890. John Collins Warren, M.D., LL.D., Hon. F.R.C.S. Eng.
1890. Stephen Smith, A.M., M.D.
1891. Louis McLane Tiffany, A.M. Cantab., M.D.
1891. Levi Cooper Lane, A.M., M.D.
1892. Charles B. Porter, M.D.
1892. W. W. Keen, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1893. Roswell Park, A.M., M.D.
1893. Lewis S. Pilcher, M.D.
1894. Jacob Rowland Weist, A.M., M.D.
1894. John B. Roberts, A.M., M.D.
1895. Christian Fenger, M.D.
1895. William H. Carmalt, A.M., M.D.
1896. Theodore A. McGraw, M .D.
1896. John Ashhurst, Jr., M.D.
1897. James McFadden Gaston, A.B., M.D.

ELECTED

1897. Maurice Howe Richardson, A.B., M.D.
1898. Albert Vander Veer, A.M., M.D., Ph.D.
1898. Solon Marks, M.D.
1899. C. B. G. de Nancrède, A.M., M.D.
1899. Edmond Souchon, M.D.,
1900. John E. Owens, M.D.
1900. Clayton Parkhill, M.D.
1901. Robert Abbe, M.D.
1901. Rudolph Matas, M.D.
1902. N. B. Carson, M.D.
1902. W. J. Mayo, M.D.
1903. S. H. Weeks, M.D.
1903. C. A. Powers, M.D.
1904. Emmet Rixford, M.D.
1904. James Bell, M.D.
1905. James E. Moore, M.D.
1905. John C. Munro, M.D.
1906. Thomas W. Huntington, M.D.
1906. A. F. Jonas, M.D.
1907. Willis G. MacDonald, M.D.
1907. John F. Binnie, M.D.
1908. A. G. Gerster, M.D.
1908. Leonard Freeman, M.D.

Secretaries.

1880. Jacob Rowland Weist, M.D.
1894. Maurice H. Richardson, A.B., M.D.,
1897. Herbert L. Burrell, M.D.
1901. Dudley P. Allen, M.D.
1906. Robert G. Le Conte, M.D.

Corresponding Secretary.

1880. William Thompson Briggs, M.D.

Treasurers.

1880. John H. Packard, M.D.
1884. John H. Brinton, M.D.
1886. Phineas Sanborn Conner, M.D., LL.D.
1891. John B. Roberts, A.M., M.D.
1894. Nathaniel P. Dandridge, M.D.
1897. George Ryerson Fowler, M.D.
1906. Charles A. Powers, M.D.

Recorders.

ELECTED

1881. James Ewing Mears, A.M., M.D., LL.D.
1893. De Forest Willard, A.M., M.D.
1901. Richard H. Harte, M.D.

Members of Council.

1880. Moses Gunn, M.D.
1880. John T. Hodgen, M.D.
1880. Hunter McGuire, M.D.
1880. Robert Alexander Kinloch, M.D.
1880. Joseph Chrisman Hutchison, M.D.
1881. William Thompson Briggs, M.D.
1881. John W. S. Gouley, M.D.
1882. Richard Beverly Cole, M.D.
1882. George Washington Gay, M.D.
1882. Henry Fraser Campbell, M.D.
1883. Phineas Sanborn Conner, M.D., LL.D.
1884. John Shaw Billings, U. S. A., M.D., LL.D.
1885. L. McLane Tiffany, A.M. Cantab., M.D.
1888. W. F. Peck, M.D.
1888. Samuel W. Gross, M.D., LL.D.
1889. Frederic Shepard Dennis, M.D.
1890. Stephen H. Weeks, M.D.
1891. Claudius Henry Mastin, M.D., LL.D.
1892. Roswell Park, A.M., M.D.
1892. Robert F. Weir, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1893. James Ewing Mears, A.M., M.D., LL.D.
1894. Theodore F. Prewitt, M.D.
1895. Phineas S. Conner, M.D., LL.D.
1895. Maurice H. Richardson, M.D.
1895. De Forest Willard, M.D.
1895. N. P. Dandridge, M.D.
1896. Louis McLane Tiffany, A.M., M.D.
1897. Nicholas Senn, M.D., Ph.D., LL.D.
1897. John Collins Warren, M.D., LL.D., Hon. F.R.C.S. Eng.
1897. George R. Fowler, M.D.
1898. William W. Keen, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1898. Herbert L. Burrell, M.D.
1899. Phineas S. Conner, M.D., LL.D.
1899. Robert F. Weir, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1900. Roswell Park, A.M., M.D.
1901. Dudley P. Allen, M.D.
1901. Richard H. Harte, M.D.
1902. De Forest Willard, M.D.

ELECTED

1902. MAURICE H. RICHARDSON, M.D.
1903. GEORGE R. FOWLER, M.D.
1904. N. P. DANDRIDGE, M.D.
1904. GEORGE BEN JOHNSTON, M.D.
1905. ALBERT VANDER VEER, M.D.
1906. ROBERT G. LE CONTE, M.D.
1906. CHARLES A. POWERS, M.D.
1907. WM. H. CARMALT, M.D.
1908. C. B. G. DE NANCRÈDE, M.D.

ORIGINAL FELLOWS.

ELECTED.	NAME	RESIDENCE
1880.	Ashhurst, John, Jr.,	Philadelphia, Pa.
1880.	Benham, Silas Nelson,	Pittsburg, Pa.
1880.	Bramble, D. D.,	Cincinnati, Ohio.
1880.	Briggs, William Thompson,	Nashville, Tenn.
1880.	Brinton, John H.,	Philadelphia, Pa.
1880.	Brock, Hugh W.,	Morgantown, W. Va.
1880.	Byrd, William Andrew,	Quincy, Ill.
1880.	Cabell, James L.,	University of Virginia, Va.
1880.	Campbell, Henry Fraser,	Augusta, Ga.
1880.	Coleman, John Scott,	Augusta, Ga.
1880.	Conner, Phineas Sanborn,	Cincinnati, Ohio.
1880.	Davis, Samuel T.,	Lancaster, Pa.
1880.	Dawson, William Wirt,	Cincinnati, Ohio.
1880.	Dugas, Louis Alexander,	Augusta, Ga.
1880.	Gouley, J. W. S.	New York, N. Y.
1880.	Greene, W. Warren,	Portland, Maine.
1880.	Gross, Samuel D.,	Philadelphia, Pa.
1880.	Gross, Samuel W.,	Philadelphia, Pa.
1880.	Gunn, Moses,	Chicago, Ill.
1880.	Hodge, H. Lenox,	Philadelphia, Pa.
1880.	Hodgen, John T.,	St. Louis, Mo.
1880.	Hughes, J. C.,	Keokuk, Iowa.
1880.	Hutchison, Joseph Chrisman,	Brooklyn, N. Y.
1880.	Johnston, Christopher,	Baltimore, Md.
1880.	Keen, William Williams,	Philadelphia, Pa.
1880.	Keller, James McDonald,	Hot Springs, Ark.
1880.	Kinloch, Robert Alexander,	Charleston, S. C.
1880.	Levis, Richard J.,	Philadelphia, Pa.
1880.	McGuire, Hunter,	Richmond, Va.
1880.	Marks, Solon,	Milwaukee, Wis.
1880.	Mastin, Claudius Henry,	Mobile, Ala.
1880.	Mears, James Ewing,	Philadelphia, Pa.

ELECTED	NAME	RESIDENCE
1880.	Moore, Edward Mott,	Rochester, N. Y.
1880.	Morton, Thomas George,	Philadelphia, Pa.
1880.	Packard, John H.,	Philadelphia, Pa.
1880.	Pancoast, William Henry,	Philadelphia, Pa.
1880.	Pollock, Alexander M.,	Pittsburg, Pa.
1880.	Richardson, Tobias G.,	New Orleans, La.
1880.	Russell, Thomas Pember,	Oshkosh, Wis.
1880.	Sayre, Lewis Albert,	New York, N. Y.
1880.	Swinburne, John,	New York, N. Y.
1880.	Tremaine, William S.,	Buffalo, N. Y.
1880.	Wales, Philip Skinner,	Washington, D. C.
1880.	Weist, Jacob Rowland,	Richmond, Ind.
1880.	Westmoreland, W. F.,	Atlanta, Ga.
1880.	Wood, James R.,	New York, N. Y.
1880.	Yandell, David W.,	Louisville, Ky.

ACTIVE FELLOWS ELECTED.

ELECTED	NAME	RESIDENCE
1890.	Abbe, Robert,	New York, N. Y.
1882.	Agnew, D. Hayes,	Philadelphia, Pa.
1894.	Allen, Dudley P.,	Cleveland, Ohio.
1890.	Allis, Oscar H.,	Philadelphia, Pa.
1902.	Andrews, E. W.,	Chicago, Ill.
1901.	Armstrong, George E.,	Montreal, Canada.
1906.	Barrow, David,	Lexington, Ky.
1882.	Barton, James M.,	Philadelphia, Pa.
1896.	Baxter, George A.,	Chattanooga, Tenn.
1901.	Bell, James,	Montreal, Canada.
1900.	Bevan, Arthur Dean,	Chicago, Ill.
1882.	Billings, John Shaw,	Washington, D. C.
1901.	Binnie, J. F.,	Kansas City, Mo.
1902.	Blake, J. A.,	New York, N. Y.
1906.	Blake, John Bapst,	Boston, Mass.
1901.	Bloodgood, Joseph C.,	Baltimore, Md.
1882.	Bontecou, Reed Brockway,	Troy, N. Y.
1901.	Bosher, Lewis C.,	Richmond, Va.
1882.	Bozeman, Nathan,	New York, N. Y.
1890.	Bradford, E. H.,	Boston, Mass.
1900.	Brewer, George Emerson,	New York, N. Y.
1906.	Bristow, A. T.,	Brooklyn, N. Y.
1895.	Bryant, Joseph D.,	New York, N. Y.
1882.	Bull, William Tillinghast,	New York, N. Y.
1900.	Bunts, Frank E.,	Cleveland, Ohio.
1893.	Burrell, Herbert Leslie,	Boston, Mass.

ELECTED	NAME	RESIDENCE
1889.	Cabot, Arthur T.,	Boston, Mass.
1885.	Carmalt, William H.,	New Haven, Conn.
1896.	Carson, Norman Bruce,	St. Louis, Mo.
1882.	Cheever, David Williams,	Boston, Mass.
1896.	Cole, Charles Knox,	Helena, Montana.
1881.	Cole, Richard Beverly,	San Francisco, Cal.
1898.	Coley, William B.,	New York, N. Y.
1882.	Cómingor, John A.,	Indianapolis, Ind.
1905.	Crile, George W.,	Cleveland, Ohio.
1882.	Cunningham, Francis Deane,	Richmond, Va.
1896.	Curtis, Benjamin Farquhar,	New York, N. Y.
1906.	Cushing, Harvey,	Baltimore, Md.
1896.	Cushing, Hayward Warren,	Boston, Mass.
1897.	Da Costa, John Chalmers,	Philadelphia, Pa.
1883.	Dandridge, N. P.,	Cincinnati, Ohio.
1882.	Davis, J. S.,	University of Virginia, Va.
1892.	Deaver, John B.,	Philadelphia, Pa.
1882.	Dennis, Frederic Shepard,	New York, N. Y.
1882.	Detmold, William,	New York, N. Y.
1899.	Dunn, James H.,	Minneapolis, Minn.
1882.	Dunott, Thomas J.,	Harrisburg, Pa.
1901.	Eliot, Ellsworth, Jr.,	New York, N. Y.
1893.	Elliot, John Wheelock,	Boston, Mass.
1896.	Estes, William Lawrence,	South Bethlehem, Pa.
1898.	Evé, Duncan,	Nashville, Tenn.
1883.	Fenger, Christian,	Chicago, Ill.
1901.	Ferguson, Alexander Hugh,	Chicago, Ill.
1882.	Fifield, William Cranch Bond,	Boston, Mass.
1899.	Finney, John M. T.,	Baltimore, Md.
1882.	Forbes, William Smith,	Philadelphia, Pa.
1891.	Fowler, George R.,	Brooklyn, N. Y.
1904.	Frazier, Charles Harrison,	Philadelphia, Pa.
1898.	Freeman, Leonard,	Denver, Col.
1893.	Gaston, James McFadden,	Atlanta, Ga.
1882.	Gay, George Washington,	Boston, Mass.
1892.	Gerrish, Frederic H.,	Portland, Maine.
1890.	Gerster, Arpad G.,	New York, N. Y.
1906.	Gibbon, John H.,	Philadelphia, Pa.
1906.	Gibson, C. L.,	New York, N. Y.
1882.	Gregory, Elisha H.,	St. Louis, Mo.
1908.	Guthrie, George W.,	Wilkesbarre, Pa.
1892.	Halsted, William S.,	Baltimore, Md.
1907.	Hamann, Carl A.,	Cleveland, Ohio.
1898.	Harrington, Francis B.,	Boston, Mass.
1901.	Harris, Malcolm L.,	Chicago, Ill.
1895.	Harte, Richard, H.,	Philadelphia, Pa.

ELECTED	NAME	RESIDENCE
1898.	Hearn, W. Joseph,	Philadelphia, Pa.
1882.	Hewson, Addinell,	Philadelphia, Pa.
1889.	Homans, John,	Boston, Mass.
1899.	Horwitz, Orville,	Philadelphia, Pa.
1901.	Huntington, Thomas W.,	San Francisco, Cal.
1907.	Hutchinson, James P.,	Philadelphia, Pa.
1882.	Isham, R. N.,	Chicago, Ill.
1901.	Jacobson, Nathan,	Syracuse, N. Y.
1901.	Johnson, Alexander B.,	New York, N. Y.
1905.	Johnson, Robert W.,	Baltimore, Md.
1896.	Johnston, George Ben,	Richmond, Va.
1901.	Jonas, A. F.,	Omaha, Neb.
1899.	Kammerer, Frederic,	New York, N. Y.
1901.	La Garde, Louis A.,	Washington, D. C.
1899.	Lane, Levi Cooper,	San Francisco, Cal.
1889.	Lange, Frederick E.,	New York, N. Y.
1901.	Le Conte, Robert G.,	Philadelphia, Pa.
1882.	Little, J. L.,	New York, N. Y.
1908.	Lothrop, Howard Augustus,	Boston, Mass.
1903.	Lutz, F. J.,	St. Louis, Mo.
1901.	McArthur, L. L.,	Chicago, Ill.
1892.	McBurney, Charles,	Albany, N. Y.
1883.	McCann, James,	Pittsburg, Pa.
1896.	McCosh, Andrew J.,	New York, N. Y.
1882.	McGraw, Theodore A.,	Detroit, Mich.
1882.	McLean, Le Roy,	Troy, N. Y.
1903.	McMurtry, Lewis S.,	Louisville, Ky.
1901.	MacDonald, Willis G.,	Albany, N. Y.
1908.	MacKenzie, Kenneth A. J.,	Portland, Ore.
1904.	MacLaren, Archibald,	St. Paul, Minn.
1882.	Maclean, Donald,	Detroit, Mich.
1906.	MacMonagle, Beverly,	San Francisco, Cal.
1899.	Markoe, Francis H.,	New York, N. Y.
1898.	Martin, Edward,	Philadelphia, Pa.
1887.	Mastin, William McDowell,	Mobile, Alabama.
1895.	Matas, Rudolph,	New Orleans, La.
1903.	Mayo, Charles H.,	Rochester, Minn.
1899.	Mayo, William J.,	Rochester, Minn.
1901.	Meyer, Willy,	New York, N. Y.
1885.	Michael, Jacob Edwin,	Baltimore, Md.
1893.	Miles, Albert Baldwin,	New Orleans, La.
1893.	Millard, Perry H.,	St. Paul, Minn.
1898.	Miller, Truman W.,	Chicago, Ill.
1893.	Mixter, Samuel Jason,	Boston, Mass.
1896.	Monks, George Howard,	Boston, Mass.
1895.	Moore, James E.,	Minneapolis, Minn.

ELECTED	NAME	RESIDENCE
1898.	Morton, Thomas S. K.,	Philadelphia, Pa.
1886.	Mudd, H. H.,	St. Louis, Mo.
1904.	Mudd, Harvey G.,	St. Louis, Mo.
1906.	Mumford, J. G.,	Boston, Mass.
1900.	Munro, John C.,	Boston, Mass.
1902.	Murphy, J. B.,	Chicago, Ill.
1898.	Murray, Francis W.,	New York, N. Y.
1882.	de Nancrède, C. B. G.,	Ann Arbor, Mich.
1903.	Neilson, Thomas R.,	Philadelphia, Pa.
1882.	Norris, Basil,	Washington, D. C.
1900.	Ochsner, A. J.,	Chicago, Ill.
1900.	Oliver, J. C.,	Cincinnati, Ohio.
1905.	Oviatt, Charles W.,	Oshkosh, Wis.
1882.	Owens, John E.,	Chicago, Ill.
1899.	Parham, F. W.,	New Orleans, La.
1885.	Park, Roswell,	Buffalo, N. Y.
1882.	Parkes, Charles T.,	Chicago, Ill.
1896.	Parkhill, Clayton,	Denver, Col.
1893.	Parmenter, John,	Buffalo, N. Y.
1908.	Peck, Charles Howard,	New York, N. Y.
1883.	Peck, Washington F.,	Davenport, Iowa.
1889.	Pilcher, Lewis S.,	Brooklyn, N. Y.
1904.	Porter, Charles Allen,	Boston, Mass.
1887.	Porter, Charles Burnham,	Boston, Mass.
1882.	Porter, William Gibbs,	Philadelphia, Pa.
1896.	Powers, Charles A.,	Denver, Col.
1882.	Prewitt, Theodore F.,	St. Louis, Mo.
1908.	Primrose, Alexander,	Toronto, Canada.
1882.	Prince, David,	Jacksonville, Ill.
1886.	Ransohoff, Joseph,	Cincinnati, Ohio.
1882.	Reed, Thomas B.,	Philadelphia, Pa.
1887.	Richardson, Maurice Howe,	Boston, Mass.
1901.	Rixford, Emmet,	San Francisco, Cal.
1882.	Roberts, John B.,	Philadelphia, Pa.
1898.	Rodman, William L.,	Philadelphia, Pa.
1882.	Rushmore, John Dikeman,	Brooklyn, N. Y.
1882.	Sabine, Thomas Taunton,	New York, N. Y.
1882.	Senn, Nicholas,	Chicago, Ill.
1902.	Shepherd, F. J.,	Montreal, Canada.
1905.	Sherman, Harry M.,	San Francisco, Cal.
1882.	Smith, Alan Penniman,	Baltimore, Md.
1882.	Smith, Stephen,	New York, N. Y.
1895.	Souchon, Edmond,	New Orleans, La.
1882.	Squire, T. H.,	Elmira, N. Y.
1907.	Stillmann, Stanley,	San Francisco, Cal.
1889.	Stimson, Lewis A.,	New York, N. Y.

ELECTED	NAME	RESIDENCE
1907.	Summers, John Edward,	Omaha, Neb.
1883.	Taylor, William Edwin,	San Francisco, Cal.
1900.	Taylor, William J.,	Philadelphia, Pa.
1885.	Thompson, J. Ford	Washington, D. C.
1882.	Thompson, J. W.,	Paducah, Ky.
1882.	Thomson, William,	Philadelphia, Pa.
1882.	Tiffany, Louis McLane,	Baltimore, Md.
1882.	Vander Veer, Albert,	Albany, N. Y.
1885.	Varick, Theodore R.,	Jersey City, N. J.
1902.	Vaughan, Geo. Tully,	Washington, D. C.
1891.	Walker, Edward W.,	Cincinnati, Ohio.
1907.	Walker, John B.,	New York, N. Y.
1882.	Warren, John Collins,	Boston, Mass.
1882.	Watson, B. A.,	Jersey City, N. J.
1896.	Watson, Francis Sedgwick,	Boston, Mass.
1889.	Weeks, Stephen H.,	Portland, Maine.
1889.	Weir, Robert F.,	New York, N. Y.
1892.	Wharton, Henry R.,	Philadelphia, Pa.
1882.	White, J. William,	Philadelphia, Pa.
1891.	Wight, Jarvis Sherman,	Brooklyn, N. Y.
1882.	Willard, De Forest,	Philadelphia, Pa.
1901.	Woolsey, George,	New York, N. Y.

FELLOWS RESIGNED.

NAME	DATE OF RESIGNATION
Billings, J. S.,	April, 1898.
Bozeman, Nathan,	May, 1887.
Cabell, James L.,	September, 1888.
Coleman, J. S.,	May, 1890.
Detmold, William,	September, 1888.
Fifield, William C.,	September, 1888.
Gregory, E. H.,	May, 1893.
Hutchison, J. C.,	May, 1887.
La Garde, Louis A.,	May, 1906.
McBurney, Charles G.,	April, 1898.
Maclean, Donald,	May, 1890.
Morton, Thomas G.,	May, 1902.
Morton, T. S. K.,	May, 1908.
Packard, J. H.,	May, 1900.
Peters, George A.,	June, 1883.
Stimson, L. A.,	April, 1898.
*Thompson, J. Ford,	July, 1905.
Wales, P. S.,	May, 1887.

* Reëlected, 1908.

FELLOWSHIP FORFEITED.

NAME	DATE FORFEITED
Cole, R. Beverly,	May, 1887.
Comingor, J. A.,	May, 1893.
Davis, S. T.,	May, 1890.
*Fenger, C.,	May, 1890.
Gouley, J. W. S.,	May, 1890.
Hewson, A.,	May, 1887.
Isham, R. N.,	April, 1898.
Keller, J. M.,	May, 1887.
McLean, Le Roy,	May, 1890.
Michael, J. E.,	May, 1895.
Pollock, A. M.,	May, 1890.
Russell, Thomas C.,	May, 1893.
Smith, A. P.,	May, 1894.
Swinburne, John,	September, 1888.
Taylor, W. E.,	May, 1895.
Tremaine, W. S.,	May, 1895.
Westmoreland, W. F.,	September, 1888.

FELLOWS DECEASED.

NAME	DATE OF DEATH
Agnew, D. Hayes,	March 22, 1892.
Ashhurst, John, Jr.,	July 7, 1900.
Benham, Silas Nelson,	November 3, 1890.
Briggs, William Thompson,	June 13, 1894.
Brock, Hugh W.,	April 24, 1882.
Byrd, William Andrew,	August 14, 1887.
Campbell, Henry Fraser,	December 15, 1891.
Cunningham, Francis Deane,	September 11, 1885.
Davis, John Staige,	July 18, 1885.
Dawson, William Wirt,	February 16, 1893.
Dugas, Louis Alexander,	October 19, 1884.
Dunn, James H.,	June 16, 1904.
Dunott, Thomas Justus,	May 20, 1893.
Fenger, Christian,	March 7, 1902.
Forbes, William Smith,	December 17, 1905.
Fowler, George Ryerson,	February 6, 1906
Gaston, James Mc Fadden	November 17, 1903.
Greene, W. Warren,	September 10, 1881.
Gross, Samuel David,	May 6, 1884.
Gross, Samuel Weissel,	April 16, 1889.

* Reëlected, 1893.

NAME	DATE OF DEATH
Gunn, Moses,	November 4, 1887.
Hodge, H. Lenox,	June 16, 1881.
Hodgen, John T.,	April 28, 1882.
Homans, John,	February 7, 1903.
Hughes, J. C.,	August 10, 1881.
Johnston, Christopher,	October 11, 1891.
Kinloch, Robert Alexander,	December 23, 1891.
Lane, Levi C.,	February 19, 1902.
Levis, Richard J.,	November 12, 1890.
Little, James Lawrence,	April 4, 1885.
McCann, James,	——, 1893.
McGuire, Hunter,	September 19, 1900
Markoe, Francis H.,	——, 1907.
Mastin, Claudius Henry,	October 3, 1898.
Michael, J. Edwin,	December 7, 1895.
Miles, Albert B.,	August 5, 1894.
Millard, Perry H.,	February 1, 1897.
Mudd, Henry Hodgen,	November 20, 1899.
Norris, Basil E.,	October, 1895.
Pancoast, William H.,	January 5, 1897.
Parkes, Charles T.,	March 28, 1891.
Parkhill, Clayton,	January 16, 1902.
Peck, Washington F.,	December 12, 1891.
Porter, William Gibbs,	January 30, 1906.
Prewitt, Theodore F.,	October 17, 1904.
Prince, David,	December 19, 1889.
Reed, Thomas Baird,	April 1, 1891.
Richardson, Tobias G.,	May 26, 1892.
Sabine, Thomas Taunton,	August 23, 1888.
Squire, Truman Hoffman,	November 27, 1889.
Thompson, Joseph W.,	March 30, 1886.
Varick, Theodore Romeyn,	November 23, 1887.
Watson, Beriah Andrew,	December 22, 1892.
Weist, Jacob Rowland,	May 14, 1900.
Wight, Jarvis S.,	November 16, 1901.
Wood, James R.,	May 4, 1882.
Yandell, David Wendell,	May 2, 1898.

SENIOR FELLOWS.

NAME	RESIDENCE
Allis, Oscar H.,	Philadelphia, Pa.
Barton, James M.,	Philadelphia, Pa.
Bradford, E. H.,	Boston, Mass.
Carmalt, William H.,	New Haven, Conn.
Cheever, D. W.,	Boston, Mass.

NAME	RESIDENCE
Conner, P. S.,	Cincinnati, Ohio.
Gay, George W.,	Boston, Mass.
Halsted, Wm. S.,	Baltimore, Md.
Keen, W. W.,	Philadelphia, Pa.
Marks, Solon,	Milwaukee, Wis.
Mastin, Wm. M.,	Mobile, Ala.
Mears, James Ewing,	Philadelphia, Pa.
Owens, John E.,	Chicago, Ill.
Porter, C. B.,	Boston, Mass.
Rushmore, John D.,	Brooklyn, N. Y.
Thompson, J. Ford,	Washington, D. C.
Tiffany, L. McLane,	Baltimore, Md.
Vander Veer, A.,	Albany, N. Y.
Warren, J. Collins,	Boston, Mass.
Weir, Robert F.,	New York, N. Y.
Willard, De Forest,	Philadelphia, Pa.

SENIOR FELLOWS DECEASED.

NAME	DATE OF DEATH
Bontecou, R. B.,	—— ——
Brinton, John H.,	March 18, 1908.
Senn, Nicholas,	January, 1908.
Thomson, William,	——, 1907.

HONORARY FELLOWS.

ELECTED	NAME	RESIDENCE
1885.	Annandale, Thomas,	Edinburgh, Scotland.
1882.	Atlee, John L.,	Lancaster, Pa.
1907.	Balance, Charles,	London, England.
1886.	Bigelow, Henry J.,	Boston, Mass.
1905.	Billings, John S.,	New York, N. Y.
1885.	Billroth, A. C. Theodor,	Vienna, Austria.
1891.	Bryant, Thomas,	London, England.
1891.	Chiene, John,	Edinburgh, Scotland.
1885.	Czerny, Vincent,	Heidelberg, Germany.
1891.	Durham, Arthur Edward,	London, England.
1885.	Erichsen, Sir John Eric,	London, England.
1893.	Gussenbauer, Carl,	Prague, Germany.
1891.	Harrison, Reginald,	London, England.
1890.	Horsley, Victor A. H.,	London, England.
1882.	Horwitz, P. J.,	Philadelphia, Pa.
1896.	Humphry, Sir George Murray,	Cambridge, England.
1882.	Hunt, William,	Philadelphia, Pa.

ELECTED	NAME	RESIDENCE
1894.	Kocher, Theodor,	Berne, Switzerland.
1885.	Lister, Lord Joseph,	London, England.
1886.	MacCormac, Sir William,	London, England.
1894.	Macewen, William,	Glasgow, Scotland.
1896.	Moore, Edward Mott,	Rochester, N. Y.
1908.	Moynihan, B. G. A.,	Leeds, England.
1907.	Myles, Sir Thomas,	Dublin, Ireland.
1887.	Ollier, Dr. Leopold,	Lyons, France.
1885.	Paget, Sir James,	London, England.
1882.	Parker, Willard,	New York, N. Y.
1894.	Péan, Jules E.,	Paris, France.
1882.	Post, Alfred C.,	New York, N. Y.
1907.	Pozzi, Samuel,	Paris, France.
1902.	Robson, A. W. Mayo,	Leeds, England.
1894.	Schede, M. H. E. W.,	Hamburg, Germany.
1882.	Sims, J. Marion,	New York, N. Y.
1882.	Smith, Stephen,	New York, N. Y.
1896.	Terrier, Felix,	Paris, France.
1894.	Thiersch, Karl,	Leipzig, Germany.
1907.	Trendelenburg, F.,	Leipzig, Germany.
1885.	Verneuil, A. A. S.,	Paris, France.
1894.	von Bergmann, Ernst,	Berlin, Germany.
1885.	von Esmarch, Friedrich,	Kiel, Germany.
1886.	von Langenbeck, Bernhardt,	Wiesbaden, Germany.
1885.	von Nussbaum, J. N.,	Munich, Germany.
1885.	von Volkmann, Richard,	Halle, Germany.
1894.	Wells, Sir Thomas Spencer,	London, England.
1896.	Yandell, David W.,	Louisville, Ky.

HONORARY FELLOW RESIGNED.

NAME	DATE OF RESIGNATION
Post, Alfred C.,	September, 1888.

HONORARY FELLOWS DECEASED.

NAME	DATE OF DEATH
Annandale, Thomas,	——, 1907.
Atlee, John Light,	October 1, 1885.
Bigelow, Henry Jacob,	October 30, 1890.
Billroth, Albert Christian Theodor,	January 5, 1894.
Durham, Arthur Edward,	May 7, 1895.
Erichsen, Sir John Eric,	September 23, 1896.
Gussenbauer, Karl,	June, 1903.

NAME	RESIDENCE
Harrison, Reginald,	——, 1907.
Horwitz, P. J.,	September 28, 1904.
Humphry, Sir George Murray,	September 24, 1896.
Hunt, William,	January 5, 1897.
MacCormac, Sir William,	December 4, 1901.
Moore, Edward Mott,	March 3, 1902.
Parker, Willard,	April 25, 1884.
Péan, Jules E.,	January 30, 1898.
Paget, Sir James,	December 30, 1899.
Schede, Max,	——, 1902.
Sims, J. Marion,	November 13, 1883.
Thiersch, Karl,	April 28, 1895.
von Bergmann, Ernst,	—— ——
von Esmarch, Friedrich,	——, 1907.
von Langenbeck, Bernhardt,	September 30, 1887.
von Nussbaum, J. N.,	October 31, 1890.
von Volkmann, Richard,	November 28, 1889.
Verneuil, Aristide A. S.,	June 11, 1895.
Wells, Sir Thomas Spencer,	January 31, 1897.
Yandell, David W.,	May 2, 1898.

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